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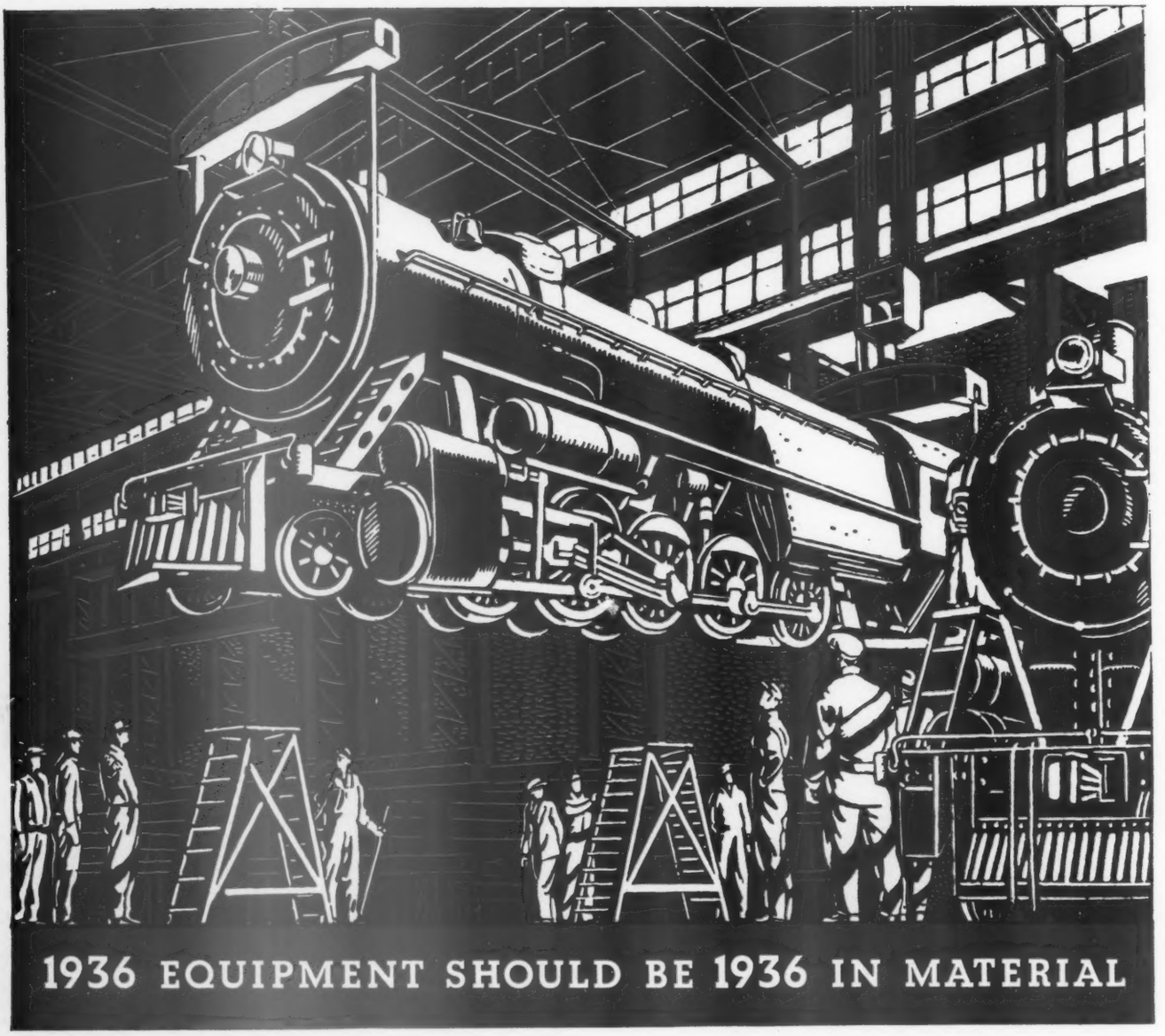

1936 EQUIPMENT SHOULD BE 1936 IN MATERIAL

Design should start with a consideration of materials. » » » New steels make possible a lightening of parts; the use of higher stresses and the assurance of lower maintenance thru greater fatigue and wear resistance. » » » With Republic Double Strength Steel one pound of material does the work of two. Firebox sheets of Toncan Iron resist fire-cracking and corrosion; Agathon Nickel Iron makes case-hardened parts last longer; a number of special alloy steels and iron give greater strength and longer life to rods, pins, engine bolts, staybolts and other vital parts. » » » Before you get too far with equipment planned for 1936, consult Republic on its special steels for railroad service. » » »

REPUBLIC STEEL

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Timely MESSAGES

From the leaders of Mechanical Department Associations and Related Government Officials

FOR several years the natural forces of recovery in this country have been attempting to assert themselves. Until recently, however, they have been more or less effectively thwarted. It now appears, on the basis of developments during recent months, that we are quite definitely headed for better times.

The railroads have had a long and difficult struggle. They have cut their forces to a minimum, younger men have been almost entirely eliminated, and to a large extent training processes have been discontinued. In the effort to conserve their resources, they have failed to replace old and obsolete equipment and facilities, and maintenance has been deferred to as great an extent as possible, except where safety was concerned.

Bright Lights in Picture

There are some bright lights in the picture. In the effort to fight unfair and subsidized competition and retain business, railroad services have been greatly improved, even in these lean years. Air conditioning of passenger cars was started in the very depths of the depression and this is true, also, of the introduction of the high speed, streamline trains.

Railway equipment manufacturers were forced to close down their plants and struggle along with skeleton organizations, yet their engineering and research forces have been kept on the job, ceaselessly searching for improvements which would make it possible for the railroads to operate with greater efficiency and economy, at the same time speeding up and improving the comfort and convenience of their services. As a result, many new materials and devices and types of equipment are now available, which, when installed, should contribute to improved services and increased earnings.

The clouds seem to be breaking and the stage is now being set for a distinct forward movement. Man power to meet these new conditions is a prime essential. No steps should now be overlooked to recruit and train the men that will surely be needed within a matter of months. A few far-sighted mechanical department officers quietly took the first steps in this direction months ago. Six years of depression have seen the passing of many of the older skilled supervisors and workers. This gap must be closed up, and quickly, if the railroads are to keep pace with the demands that will surely be made upon them in the near future.

Value of Mechanical Associations

One agency of great value in coaching the officers and supervisors and in inspiring and spurring them on to greater and more effective efforts, is highly specialized group meetings and conventions. The associations of various groups of mechanical department officers and supervisors have suffered severely and have almost discontinued operations during the past few years. Based upon past performances these associations are invaluable, and yet the railroad managements have been so harassed with difficulties that in the mechanical department, at least, they have been allowed to lie more or less dormant. Interestingly enough, this is not true to the same extent of associations of other than the mechanical department. The engineering, signaling, operating and traffic organizations have functioned much more actively and aggressivley throughout most of the depression.

Can the mechanical department associations stage a real and substantial comeback? Apparently this will depend upon the small nucleus of officers and active members in each group. The possibility of reviving some of these organizations to something of their old vigor was demonstrated last fall, when four of them—in the face of lukewarm approval or even opposition of the official bodies—held short meetings and put over programs—particularly good programs under the circumstances.

Such organizations mean much to the railroads, even though their value at this time is being largely overlooked. Unofficial as they are in most cases, their functioning depends upon the interest, initiative and ability of the outstanding leaders in the different groups. Here is a positive and constructive force for improvement and betterment that should be conserved and encouraged. With better times ahead—even if farther away than now seems apparent—it is not a bit too early to start to move forward. Indeed, it appears that we have already too long delayed in getting started.

With these thoughts in mind we have invited the leaders of the various mechanical department associations to utilize our pages this month, extending greetings to their fellow members and telling something of the problems which must be tackled, and the plans that are now contemplated or in process. Then, too, we have asked for expressions from some of the government representatives who work intimately with the mechanical department officers.

These messages follow, and with them go the enthusiastic good wishes of the staff of the *Railway Mechanical Engineer* for a most happy and prosperous year to our readers throughout the world—in whatever department, or wherever they may be.

INVEST IN MAN-POWER

Now is the time to recruit promising young men

by O. A. GARBER

Chairman, Division V—Mechanical—Association of American Railroads; (Chief Mechanical Officer, Missouri Pacific Railroad)

TO Members of the Mechanical Division, Association of American Railroads: In my opinion the problem confronting us most pressingly in the immediate future is the proper selection of young men for mechanical training.

Most of the railroads, in some craft, and a few of the more fortunate railroads in all crafts, have increased the personnel to the extent that under our agreements with the shop crafts we can augment our force of apprentices.

I hope and feel that the present upturn in business is going to be such that practically all of us will be putting on a considerable number of new apprentices during the next year or so. At this time we have a large number of high-grade young men from which to choose. The selection must be intelligently supervised in order to select young men of good education, preferably graduates of high school, and boys who are mechanically inclined. Sometimes we can secure a boy who has had one or more years in a mechanical college or technical school.

After they are employed our opportunity for properly training them to make high grade mechanics, useful citizens and in many cases efficient supervisors is unlimited. The shop supervisor, the general foreman, the master mechanic or the shop superintendent should all appreciate the importance of carefully checking these young men in the early stages of their employment, and if it is found that they are lacking in desire or attentiveness, in all fairness to the young men they should be directed to other lines of endeavor. Those who do indicate an ability to learn mechanical work and are willing to study to improve themselves should be in a position to secure through you a line of educational training for apprentices which a number of roads have in effect, some with their own staffs and some with outside institutions which specialize in this work.

Any railroad will be well repaid for investing in educational training for these young men.

LOOKS FORWARD TO 1936 CONVENTION

Perplexing problems to be solved; new facilities and equipment available

by A. H. KEYS

President, International Railway General Foremen's Association; (District Master Car Builder, Baltimore & Ohio)

TO Members of the International Railway General Foremen's Association: I wish to convey to each of you my sincere good wishes for a happy and prosperous New Year. The International Railway General Foremen's Association was formed on September 7, 1905, a little more than thirty years ago, by a small group of master mechanics, superintendents of shops and general foremen. These men felt the need of an international organization, made up of railroad general foremen, both in the car and locomotive departments, who could attend annual meetings or conventions to discuss the various improvements and to learn from each other the many short cuts that can be effected in shop operations.

The annual meetings which have been held subsequent to that time have, I am sure, proved of great mutual benefit to the members of our association, as well as

to the railroads we represent. During the trying period through which the railroads have passed in the last five years, it has been impossible for our organization to meet in convention, although there have been regular annual meetings of officers and committeemen. At our last meeting in Chicago during September, the attendance was gratifying and the committee reports and the discussions were most interesting and instructive. I am sure all of those who attended took home with them many new ideas that will react for the mutual benefit of both the railroads and their employees, in the matter of increased efficiency and better maintenance in equipment.

The present business outlook for industry indicates substantial gains, and we all are hopeful that carloadings on the railroads will continue to rise; this in turn will create a demand for additional car and locomotive equipment. We are also hopeful that it will be possible to meet in convention in 1936, so that our membership throughout the country can again come together and thrash out the many perplexing problems that have confronted them since the last convention, view exhibits showing the improved locomotive and car appurtenances which have been developed since that time, and get first-hand knowledge from the exhibitors as to their proper maintenance. When they return to their respective shops they can then pass on this knowledge, to the mutual advantage of both the members, their subordinates and the railroads which they represent.

URGES YOUNGER MEMBERS TO PICK UP REINS AND CARRY ON

"We cannot stand still; we must push on to greater achievements"

by W. H. CLEGG

President, Air Brake Association; (Chief Inspector, Air Brakes and Car Heating Equipment, Canadian National Railways)

TO Members of the Air Brake Association: In sending my greetings to you at this time it is with the hope that we may anticipate a personal exchange of greetings in the very near future. Our association, for obvious reasons, has been quite inactive since our last meeting in Chicago in 1930. Up to that time it played a very important role in the country's railway transportation problems. Its activity also served admirably as an educational and highly specialized medium to the Air Brake Art.

The railways were never in greater need of united action by our members concerning the fundamentals involved in the study of valvular and foundation brake developments, the handling of such intricate and delicate mechanisms, together with the high standard of accuracy in the maintenance of such equipments to meet the problems of braking requirements for lightweight heavy-capacity freight cars, controlling the long heavy freight trains, and stopping the high-speed passenger trains of today. Great strides have been made during recent years in the development of air brake designs of one kind and another, at very great cost, to meet the operating conditions demanded by such an extensive and populous country. The railways have, by test and trial, also spent large sums of money in the hope of finding a satisfactory answer to such problems.

It is the objective of the Air Brake Association, by discussion in convention, by the work of its various committees and through co-operative effort of its members, to diffuse the much needed information concerning the endless developments in brake equipment—its new functions, care, management and requirements—to meet the ever increasing demand for greater knowledge on the part of those directly concerned with its proper functioning, maintenance and operation—all of which have become so much more exacting and important in every phase and detail.

During these recent years many of our valued members have retired from active service, others have passed on, and the younger men in the field must pick up the reins dropped by their predecessors and carry on. We cannot stand still; we must push on to greater achievements in that spirit of zeal, courage, determination and tenacity of purpose which is so characteristic of the Air Brake Association.

EFFICIENT LOW-COST LOCOMOTIVE OPERATION

by

A. T. PFEIFFER

President, Traveling Engineer's Association;
(Road Foreman of Engines, New York Central)

Fast schedules must be maintained in both freight and passenger service— Fuel must be saved

IT is with great pleasure that I extend my greetings for a happy and prosperous New Year to the members of the Traveling Engineers' Association, with the hope and confident expectation that it will continue, as it has in the past, its efforts to improve locomotive service on American railroads.

It is doubtful if any businesses have been so hard hit in the last five years as our railroads. Unlike some of the competing types of transportation, they have not been subsidized with governmental aid.

The depression has prevented the Traveling Engineers' Association from holding its annual conventions to discuss problems of more efficient and more effective locomotive operation. Through the persistent efforts of our secretary, W. O. Thompson, meetings of the executive committee were held each year up to 1935, when we held our recent convention. The Association has been held intact and stands ready to do everything in its power to assist in improving locomotive conditions in the future.

It is of vital importance that fast schedules in both passenger and freight service be maintained, in order to compete effectively with other types of transportation, including buses, trucks and air lines. These have made inroads into the business of the railroads, particularly since only recently has the public taken any steps to place them under adequate regulation.

The task of our members is to bring about more efficient locomotive operation and to reduce the fuel costs. We are looking forward to a large attendance at our 1936 convention, in order that we may prepare more effectively to solve some of the pressing problems in locomotive operation which now confront us. Surely our membership, with railroad executives, officers, supervisors and employees in all capacities, can be an effective force for betterment.

SET PACE FOR OTHERS TO FOLLOW

Boiler makers out to make a real record for their association

by **O. H. KURLFINKE**

President, Master Boiler Makers' Association;
(Boiler Engineer, Southern Pacific Railroad)

TO members of the Master Boiler Makers' Association: I thank the *Railway Mechanical Engineer* for affording me this opportunity to extend to each of you the season's greetings and to wish you a prosperous New Year.

I also take this occasion to inform you that, in collaboration with the executive board through its chairman and the valued counsel of the secretary, plans are being formed which we believe will make our 1936 business meeting the most interesting and successful one of its kind the members will have the opportunity to attend for some time.

Our first obligation is to insure that the Master Boiler Makers' Association will always be so organized that it will be prepared to function in a manner that will place and keep it at the top of the list of independent organizations.

We are all aware of the reversals the railroad industry received during the past several years and know that upon their return to normalcy they will make changes which will alter the methods of conducting their affairs in order to eliminate waste wherever it is found to exist. Therefore, it is equally important for us not only to have as our object the exchanging of views among ourselves so that we may profit by the experience of other members, but also to have as our object the spirit of broadcasting in our proceedings a definite stand that our members as an association are united and will not be afraid officially to recommend sound and practical methods as standard practice so the industries, and especially our employers, will have the benefit of our general interchange of views.

Your active officers will have presented at the next meeting a series of topics which will command your attention. The particular topic at that time will be on "Law." This will include proposed changes to our Constitution and By-Laws which were prepared with a view to setting up the organiation on lines which will expedite the handling of its affairs and also effect economy where possible to do so.

Considerable thought and effort have been expended to have a method of procedure which will bring out definite conclusions in the discussion of topics covering the best practices and these will be presented to you for your approval. I urgently request that all of you make it a New Year's resolution to be on hand at the 1936 meeting, and take personal action and express your views on these proposed changes and to support the efforts your officers have conscientiously made to make your association foremost and at all times the one that will set the pace for others to follow.

HOW TO REDUCE THE FUEL BILL

Program of Fuel Association adapted to meet changing operating conditions

by C. I. EVANS
President, International Railway Fuel Association; (Chief Fuel Supervisor, Missouri-Kansas-Texas Railroad)

TO the Officers and Members of the International Railway Fuel Association: Greetings. The International Railway Fuel Association enters its twenty-seventh year of existence with better prospects and greater responsibilities than for the past five years.

From the best information obtainable it is believed that business for the railroads will be better during 1936 than 1935, but the conditions of operation are more difficult. The time schedules in both passenger and freight service have been shortened, necessitating higher speeds, which require that more fuel be used and lighter trains be handled thus increasing the cost of transportation.

Passenger rates and the rates on many commodities are lower, which makes it necessary to handle more business in order to take in as much money.

The price of fuel is higher. Our problem then, is how to reduce the fuel bill with more exacting conditions of service, with faster time and lighter trains, made necessary by the competition of other methods of transportation.

All employees should be and I believe are, vitally interested in seeing that the net revenue of their particular railroads is as great as possible and every employee in the mechanical and transportation departments, from the call boy to the general manager, can help increase the net by giving a little more thought to his work, and doing his job, whatever it may be, a little better than he has ever done it before.

Our program of subjects for the consideration of the association this year is similar to former years, but arranged in light of the changed operating conditions.

The chairmen of the committees on these subjects, and the individual members of these committees, are all experienced and outstanding in their line of work and were chosen from all parts of the country so that the best information might be obtained to enable the chairmen to compile the contributions into the most valuable reports possible for the benefit of all railroads, including Canada and Mexico.

With more business and more thought put into action by those who are responsible for getting the best results from the use of fuel, combined with the close cooperation of all other employees, I feel confident that by December 31, 1936, our problem will be solved satisfactorily.

PROBLEMS HAVE GROWN AND MULTIPLIED

One idea from convention may offset the cost of a dozen years' attendance

by H. L. TAYLOR

President, American Railway Tool Foremen's Association; (Baltimore & Ohio Railroad)

TO the Members of the American Railway Tool Room Foremen's Association: It is with great pleasure that I take advantage of the opportunity offered to me through the courtesy of the *Railway Mechanical Engineer* to extend greetings to our members.

It would, of course, be much more pleasant to extend the hand in hearty greetings, but due to forces which were beyond our control it has not been possible to do this.

It would seem from all signs that the coming year will lift us from the slough of depression and if the portents are correct then we should be able to assemble once more in the Spring. We are preparing to start preparations to assure as large attendance as possible and earnestly request your presence.

Since our last meeting our problems have grown and multiplied, and there is much work to do. Streamlined locomotives, Diesel locomotives, new designs and materials, all kinds call for new designs of tools and tools of better material. Problems galore have crept in with the desire of the management for more economical operation. New designs in pneumatic hammers and drills, and in some cases new inventions have been devised which should be discussed for the benefit of our members. All of these developments, of course, are shown and discussed in the various trade papers, which are invaluable in keeping us in contact with the development of new ideas and refinements in the old, but the application of these to our own problems are our own province and herein lies the value of our Association.

The discussions in the meetings, the "swapping" of ideas and the solutions of difficulites are of inestimable value to our companies and one item carried back will frequently more than compensate for the cost of a dozen years of attendance. We will do our part and sincerely request you to do yours to bring this to the attention of your supervisors so that we will have a large attendance when we assemble. We know you will be enthusiastic when you get there, so let's all *come!*

READY TO GO AHEAD

Great need for special educational effort at this time

by K. F. NYSTROM

President, Car Department Officers' Association; (Superintendent Car Department, C. M. St. P. & P.)

OFFICERS and members of the Car Department Officers' Association have conscientiously complied with the wishes of the Association of American Railroads and have not held any conventions or carried on any activities which would involve expense during the time of depression. We will continue to observe these wishes, hoping for a definite expression from the Association to indicate whether or not the various mechanical associations are desirable as an educational factor among mechanical supervisors.

The Car Department Officers' Association—formerly the Railway Car Department Officers' Association and the Southwestern Master Car Builders and Supervisors' Association, which were amalgamated in 1928—has a long and honorable record of serving as an educational institution. Its activities consisted of having a number of committees

study car department problems. At the annual conventions, which had a large attendance, valuable papers were presented, which were enthusiastically discussed—all pertaining to car department matters, with particular emphasis on interchange problems. In addition, from the experience of the members attending from various parts of the continent, recommendations were made to the old Master Car Builders' Association and later to the American Railway Association to change or clarify interchange rules. The recommendations thus submitted were in the majority of cases favorably acted upon, since they came from men who faced the actual problems.

By meeting members from other railroads at the conventions, acquaintances and friendships were made and understandings developed which, in addition to the educational value, made it easier to handle the interchange of cars among the railroads. Unquestionably the exchange of ideas by members at the conventions, or as a result of acquaintances formed at such conventions, effecting shop practices and methods of handling of work, have been of untold benefit to railroads represented in this Association. The spirit and enthusiasm manifested at these conventions could only be interpreted to mean an expression of the desire on the part of those attending fully to take advantage of the opportunity to improve their knowledge.

The future of the Car Department Officers' Association depends on two things: First, will it have the full sanction of the Association of American Railroads, and second, can it prove its usefulness? During the depression many supervisors were laid off or demoted, many of whom will not be available when business improves, and their knowledge and experience is thus lost to us. Unfortunately very few men have been trained and educated to take their places. I feel that if the Car Department Officers' Association is again permitted to function as it did prior to the depression that the railroads will be repaid many fold by reason of furthering the education of its members and it will also be helpful to the younger men starting their career in the supervisory field.

May I express my humble appreciation for the confidence, loyalty and support given me by members of our Association, and extend to all hearty greetings.

RAILROAD MECHANICAL ENGINEERING

Specialized upon by independent group of interested engineers

by GEORGE W. RINK

Chairman, Railroad Division American Society of Mechanical Engineers
(*Mech. Eng., Reading Company*)

AS chairman of the Railroad Division I extend greetings to all engineers engaged in furthering the interest of the railroads and welcome them to the meetings of the American Society of Mechanical Engineers.

The membership of the Railroad Division of the A.S.M.E. is made up of representative mechanical engineers from the railroads, the railway supply industry and our engineering colleges —men who are engaged in the study and perfection of materials, devices and facilities required for use on the railroads, as well as in the development of new types of motive power and equipment to meet the demands of the public and in the interest of safety and economy of operation.

The Railroad Division is active in encouraging study and development of the underlying fundamental principles of mechanical engineering applicable to railway use. Its endeavor is to be cooperative with the activities of the Association of American Railroads.

Typical of the activities of the Railroad Division is its participation in the recent annual meeting of the American Society of Mechanical Engineers. The Railroad Division held three sessions and due to the activity of its committee on meetings and papers, of which W. H. Winterrowd is chairman, a number of papers were presented which involved considerable research on the part of the authors. These papers had reference to various

problems in connection with the action of locomotives and cars while in motion. The committee on survey also presented a paper on the progress made in railroad mechanical engineering during 1935.

L. W. Wallace, in charge of research work for the American Association of Railroads, addressed the members and emphasized the importance of research; he paid a glowing tribute to the railway supply companies, which at considerable expense are working on the problems now confronting the railroads. He also commented on the large expense borne by the railroads and air brake companies in conducting the air brake tests on the Southern Pacific, which resulted in the adoption of the new "AB" brake.

The committees are composed of representative men in the field of engineering. In addition to the annual meeting, which is always held in New York City, the Railroad Division of the American Society of Mechanical Engineers will hold sessions or co-operate in meetings in 1936 at Dallas, Texas, San Francisco, California, and Buffalo, New York.

A CRUSADE AGAINST ACCIDENTS

by C. F. LARSON

Chairman, Safety Section, Association of American Railroads; (Superintendent Safety, Missouri Pacific Lines)

"Safety work is the noblest of all purposes because it embodies the highest ideal of humanity"

THERE is a growing sensitivity all over the world to consider human life worth saving. Any plan for human betterment cannot overlook the protection of the individual against accidents. The ultimate aim of all industry, science and government is for a better life and better living conditions. The better life towards which we are striving must include opportunity for mental and spiritual development, as well as material comforts.

The safety movement had its origin on the American railroads, spreading from these into every industry, and into public life—on the streets and highways and in the schools—wherever hazards of accidents exist. But, nowhere has the effect of the movement been so marked as upon the railroads where it is highly organized. Every department and every classification of labor has been touched by the teachings of safety, and every department has a reflected glory to its credit.

Because of the seriousness of train service accidents, train and enginemen are frequently more gravely injured and incapacitated for longer periods than men in some other classification, since they must be 100 per cent whole when going about their tasks. The great improvement—amazing in its achievement—is one of the many happy results of the safety programs. Once, (long ago) antagonistic and suspicious of the movement, the train service employees are now the most enthusiastic. Maintenance of way employees too, have responded nobly and have much to their credit in the summary of the happy achievements of a quarter of a century.

The maintenance of equipment forces have a very large percentage to their credit in reducing casualties. This class of labor has probably an advantage over some others. Usually, and mostly, mechanical forces are recruited from boys of at least grammar school education and many are high school graduates. As a rule they are ambitious to advance to higher places in the ranks, often going from shop apprenticeships to technical schools to better prepare and fit themselves for advancement. Men in these trades, because of the attainments mentioned, are more susceptible to the teaching of safety, being appreciative of its value.

Then, too, men in the trades (mechanical) have the advantage of closer and more constant supervision than employees out on the line of railroad. Intelligent supervision is, after all the answer to the safety question. Experience has demonstrated that successful accident prevention

work among employees depends entirely upon the amount of interest and leadership accorded it and the support which is obtained from officers and supervisors, and receptivity and responsiveness of those to whom the safety message is given. A supervisor or foreman is not just a "boss." He is a leader, teacher or instructor and must have the confidence and good-will of the men entrusted to his supervision.

It is, of course, the desire of management that employees be saved from injury and time and money is spent in developing the best means or methods by which this can be attained. On well regulated properties these thought-out methods are promulgated in the way of safety rules, regulations and instructions. The supervisor is clothed with the responsibility of presenting these lessons to the men over whom they exercise authority. The best teacher is the one who knows all that he can learn about the details of his assignment and then has the ability to stimulate interest in the employees. The most important thing, then, in a railroad career is to learn the art of dealing with fellow-employees in such a way as to win their confidence and to be able to direct them in a proper way.

Accident prevention or the problem of safety is primarily an educational problem; it must be continuous, constructive and interesting. Each worker is safe in proportion as he understands the hazards of the job and he can understand only in proportion to his safety education. Example has much to do in this educational process. Officers and supervisors alike must, by their example, set the pace. Shakespeare said—"Grow great by your example," and another writer is quoted "Instead of keeping our eyes ever on others, looking for faults and mistakes, we are to look to our own example, lest something we do may hurt their lives, or cause them to do wrong."

Employees who are indifferent to the teachings and instructions offered and violate rules, are simply tampering with their consciences, excusing wrong, making it a slight thing; arguing with one's self that the act is not so bad after all. Some will say as an excuse, "I did not know and you can't hold me responsible for what I did not know." Yet is this not one of the most serious fallacies with which man can beguile himself? Man should know everything that he can know, particularly that which is socially important for him to know. We have principles of law that ignorance excuses no one. Ignorance of the laws of nature excuses no one. Ignorance of the things that are dangerous with which man operates excuses no one. Ignorance, inattention and willfulness cause the g r e a t troubles in this world. These attitudes can be changed by a properly directed educational program, emphasizing the fact that serious injuries are social problems, many of them with aspects entirely outside the scope of compensation acts or industrial welfare departments.

Sometimes only the community can attempt to deal with juvenile delinquency which results from a diminished income or from loss of discipline in a home headed by a cripple. An altered standard of living may be responsible for mental breaks and reduced ambitions. Casualty hazards are simply one group of important problems, and as such cannot be divorced from any program of industrial and economic planning. Safety work is the noblest of all purposes because it embodies the highest ideal of humanity—to save human life and limb and thereby promote happiness in the lives of workers. In this great cause,—a c r u s a d e against accidents—officers, supervisors and employees will be more effective if they are moved by the spirit of useful service.

SAFETY OF HIGH SPEED FREIGHT TRAIN OPERATION

Necessity for improvement in air brakes, draft gear and truck

by W. J. PATTERSON

Director, Bureau of Safety, Interstate Commerce Commission

ONE of the outstanding features of present-day railroad operation is increased speed. The introduction into service of light-weight, high-speed, streamlined trains, with their tremendous popular appeal, has been accompanied by a general stepping-up of passenger train schedules, and, perhaps of even greater importance, by faster freight

(*Continued at top of next page*)

train operation. To insure safety of operation of long or heavy freight trains at the relatively high rates of speed which are now authorized on many railroads, high standards in the design, construction and maintenance of mechanical equipment are required.

Efficient brakes are of primary importance. High-speed operation is safe only when brake equipment is adequate properly to control trains under all conditions. As a result of cooperative action by the Bureau of Safety and the Mechanical Division of the Association of American Railroads, rules for maintenance of power brake equipment were revised in 1926, and higher standards of maintenance which were set up by these revised rules have resulted in substantial improvement in the condition of power brake equipment in general service. Furthermore, as a result of extensive tests, the specifications for brake equipment for freight cars were revised to establish a new standard, effective September 1, 1933, and interchange rules have been revised to require not only that all new cars must be equipped with the new standard brake equipment but also that brake equipment in service must be made to conform to the improved standard progressively on an annual basis, this program to be completed by 1945.

Car trucks and draft gears, in addition to brakes, involve important safety considerations. Arch bar trucks have long since become obsolete and slated for removal from service. Experience has demonstrated that trucks of this design cannot be relied upon to withstand the stresses incident to present axle loads and train speeds. No practicable system of inspection of trucks of this design can insure safety. Under present rules, arch bar trucks will be prohibited in interchange effective January 1, 1938. Current reports of progress being made in reducing the number of cars in service which are equipped with arch bar trucks point to the need for greater attention to this important matter.

The adoption in 1931 of specifications for draft gears for freight service marks an important step in the progressive and systematic improvement in this equipment. The requirement that draft gears approved under these specifications must be applied to new cars has been in effect only two years, and only since January 1, 1935, for new draft gears applied to any cars; thus far approximately 84,000 cars have been so equipped. For the purpose of expediting removal from service of the most inefficient gears a number of such gears have been designated as obsolete, and only scrap value is allowed for replacements or parts. There are some 2,000,000 freight cars in service equipped with draft gears other than the approved standard, and for the purpose of improving the condition of these draft gears until they can be replaced by standard gears the present recommended practice rules provide that when cars are on repair tracks for periodic air brake attention by owners, defective parts of draft gears will be renewed and if the draft gear is defective or the total slack exceeds 1½ inches the draft gear will be removed for examination. Excessive free slack in draft gears is a hazard to train operation, and the present rules which are designed to effect a prompt and general improvement in this respect should be rigidly observed.

Brakes, draft gears and car trucks, adequate in design and maintained in efficient condition, are essential to the safe operation of modern freight trains. Due recognition should be accorded to mechanical department officials and employees for the constructive action which has been taken by them to provide these essentials, and the measures which have thus been inaugurated should be vigorously supported and pressed to a conclusion.

COMMENDS MECHANICAL DEPARTMENT FORCES

by JOHN M. HALL

Chief Inspector, Bureau of Locomotive Inspection, Interstate Commerce Commission

Contemplated changes in design should be carefully checked with Bureau

DURING the past five years the railroad mechanical forces have been subjected to economic pressure unprecedented in the history of American railroads. Financial conditions have resulted in drastic cuts in mechanical department appropriations, in many cases to a point where, even after consideration of every possible economy, the problem of proper maintenance

of equipment appeared almost without solution. Yet the mechanical men have carried on and results show how well they have succeeded.

We of the Bureau of Locomotive Inspection appreciate the helpful cooperation from mechanical officials and employees, also many operating officers, which has generally been encountered, for we are not unmindful that, without such cooperation, we could not have achieved the results obtained, and I am quite sure that this cooperation is a reflection of our efforts to perform our duty in the enforcement of the law and rules in an intelligent, reasonable and practical manner.

The purpose of the Locomotive Inspection Act as expressed in the title is "* * * to promote the safety of employees and travelers upon railroads * * *," and reference to the large decrease in the number of casualties since its enactment will show how well the law has fulfilled its purpose. The rules formulated under the law are based upon recognized minimum standards of safe and proper maintenance. Were it not for the existence of the law and rules it is quite probable during the past several years that additional reductions in mechanical department appropriations would have been made with consequent telling effect on the condition of locomotives and the record of casualties. Success in enforcement of any law is dependent to some extent upon the recognized need for the law and benefits to be obtained from compliance with its requirements.

Better maintenance of locomotives, with resulting decrease in number of accidents and economies in operating costs resulting from this improvement in condition of power are conclusive evidence of the necessity for this law and the success thus far attained in its enforcement.

One feature upon which I may comment is a tendency to make certain changes in the development of the locomotive which do not conform to present requirements and then, on the pretext that these changes were not contemplated at the time the rules were approved and present design is such that the requirements cannot be met, ask that exceptions be made. Some instances of this nature have occurred in the past in which it has subsequently been found that there was no necessity for the claimed exemptions. When changes in design are contemplated we would emphasize the advisability of examination of pertinent rules and, in case of apparent conflict with or restriction of the proposed design, suggest that the question be discussed with this bureau in order that violations may be avoided. It is desirable that proper consideration be given to new designs that they may comply with the requirements rather than to proceed with the changes and then attempt to stretch the structures of the law to cover them.

When changes in or new rules are thought desirable, the modus operandi is plainly set out in Section 5 of the law. However, it is pointed out that such changes are not effective until they have been approved by the Interstate Commerce Commission.

MECHANICAL OFFICERS CHALLENGED

Success in competing with other types of carriers will depend on proper equipment

by OTTO S. BEYER

Director, Section of Labor Relations, Federal Co-ordinator of Transportation

JUST as in the days of Stephenson, motive power and rolling stock are still the chief physical instruments of railroad transportation. But the railroads, because of new ways of utilizing power for the movement of vehicles, no longer enjoy the monopoly of transportation they once did. The challenge to the railroads because of these developments is therefore chiefly a challenge to those to whom the future of the mechanical equipment is entrusted. If they are successful in designing and building equipment which will permit of operating short, light trains and furnishing frequent, rapid service, the railroads stand to hold

their own in the struggle which now confronts them.

In the circumstances, it behooves all who have to do with the mobile plant of our railroads to visualize the needs of the time and, as a first step, agree that coordinated research in the field of railroad equipment engineering and utilization is indispensable to genuine progress in the rehabilitation of the railroad industry.

I for one would like to see the mechanical personnel of our railroads—officers, technical experts and mechanics—assert themselves in no unmistakable terms on this matter. The time is ripe!

SHORT HAUL PASSENGER PROBLEM

Mechanical department must furnish equipment to provide cheap, convenient, fast and comfortable service

by JOHN C. EMERY

Director, Passenger and Merchandise Service, Section of Transportation Service, Federal Co-ordinator of Transportation

THERE are few railroad problems more perplexing than that of how to develop short-haul passenger traffic. Primarily, of course, this is a matter for the traffic department to worry about, but it concerns mechanical department officers also because the answer may have to come from them.

Some railroad men are convinced that the local passenger business is "gone for good." Granting that the situation is not encouraging, the fact remains that local passenger traffic must not be "gone for good" from the railways. It is a vital necessity if the railroads are to make a comeback as passenger carriers.

The elements of the short-haul passenger problems can be simply stated. This business is moving now largely in private automobiles, and the automobile is chosen because it is cheap, it is convenient, it is fast, and it is comfortable. These are the service features which the railroads must offer if they want the business. What type of vehicle can the railroads employ to fill the bill?

Cheapness means a low rate of fare, so the railroad vehicle must be economical in operating cost. Convenience means frequent service even over light-traffic lines, so the railroad vehicle must be small enough to permit the operation of several schedules a day at low cost. Speed means rapid acceleration as well as ability to maintain a fast pace, so the railroad vehicle must have adequate power, but not so much as to interfere with economy. Comfort means easy riding, so the railroad vehicle must be designed to roll as smoothly and seat the passengers as comfortably as a limited train.

Those are the specifications, and they indicate at a glance the kind of vehicle which will embody them. The highway motor coach comes close to matching the specifications, but so much progress has been made lately in the design of light rail units that there is great hope for these.

Mechanical department officers can render an invaluable service to the railways by giving their full support to the further development and refinement of the light rail passenger car. The car that will help solve the short-haul passenger problem will pay handsome dividends to the railways.

Steam Rate and Indicated Horsepower of Locomotives[1]

By Arthur Williams[2]

A simple method of determining the steam rate by measurement of heat drop without taking indicator cards—Horsepower calculated by using exhaust nozzle as a flowmeter

THE overall efficiency of a locomotive may be divided into three parts: The engine or cylinder efficiency, the boiler-combustion efficiency, and the machine efficiency. A measure of the cylinder efficiency is the steam rate, or steam consumption per indicated horsepower-hour. In the past this has been determined by measuring the indicated horsepower and the steam to the engines, and dividing the second by the first. It is somewhat difficult, on a road test, to determine these values accurately. The indicated horsepower can be calculated when the mean effective pressure in the cylinders and the speed are known. The mean effective pressure in the cylinders is found by means of an indicator. The accuracy of the indicator depends upon the accuracy of the reducing motion from the crosshead to the indicator drum, the pencil motion on the indicator, the spring, and the area of the piston. With careful workmanship and calibration these errors are fairly small. It is more difficult, particularly at high speeds, to guard against errors due to inertia of the moving parts and to vibration of the apparatus.

Having obtained the mean effective pressure it is necessary to know the speed in order to calculate the indicated horsepower. A speed indicator is again a source of error, and if speeds are obtained by taking the time between mileposts the speed at the time the indicator card is taken may differ from the average between mileposts.

The next step in the calculation of the steam rate is to measure the steam to the engines. This is usually done by measuring the water fed to the boiler from the tender tank and subtracting the steam to the auxiliaries such as the air compressor, boiler feed pump, stoker, steam used for heating the train or for other train services, and steam wasted from the safety valve, injector overflow and blower. Errors arise, of course, in the measurement or calculation of each of these quantities.

Since the accurate measurement of the steam rate depends upon the accurate measurement of the mean effective pressure, speed, boiler evaporation, steam to auxiliaries, and steam wasted, it can readily be seen that the correct determination of the steam rate on a road test, using the test procedure outlined, is difficult. The suggestion has been made[3] that the steam rate be determined by means of the observation of the difference in heat content of the steam in the steam pipe and the exhaust. It is the purpose of this paper to show that, with reasonable precautions, this can be done on most locomotives with good accuracy and far less trouble than by using the indicator.

Theory of Measurement

The first law of thermodynamics states that "heat and mechanical energy are interconvertible and can neither be created nor destroyed." For steady-flow conditions, such as are obtained with an engine, it follows that "For any prime mover operating under these conditions the energy delivered by this apparatus in any unit of time is equal to the difference of the heat contents at entrance and exit from the apparatus, for the entire amount of working substance flowing in this unit of time, minus the radiation and conduction losses from the apparatus."[4]

With superheated steam, if the temperature and pressure are known, the heat content can be obtained from steam tables. With saturated steam it is necessary to know the percentage of moisture. To measure the temperature of the exhaust steam from locomotive cylinders, when it is superheated, is simple. To measure the amount of moisture in the exhaust steam accurately, when it is saturated, is difficult, if not impossible. Accordingly, the method described is limited to those cases where there is superheat in the exhaust steam. Since most locomotives in main-line service have some superheat in their exhaust, this limitation is not very important. It must, however always be borne in mind.

Knowing the temperature and pressure of the admitted steam and the exhaust steam, the two heat contents can be obtained from steam tables. The difference between the two gives the heat drop in B.t.u. per pound of steam. This heat drop is equal to the work done in the cylinders per pound of steam, plus the heat lost through radiation. The radiation loss is relatively small, and, if desired, can be allowed for. One horsepower-hour is equal to 2,545 B.t.u. Dividing 2,545 by the heat drop per pound of steam will give directly the pounds of steam per indicated horsepower hour. It makes no difference what processes are taking place in the cylinder, whether adiabatic, isothermal, or, as is actually the case, a turbulent process which does not follow any definite law. In the extreme case, where steam is leaking by the piston, with no work being done, the heat content would be the same in the steam pipe and in the exhaust, with due allowance for radiation. This case is ths same as that of the well-known throttling calorimeter.

Value of Method for Locomotive Tests

Since it is only necessary to measure the temperature and pressure in the steam pipe and in the exhaust from the cylinders, the test apparatus is relatively simple. It is possible for one man in the cab to take all necessary readings. This may be contrasted with the test apparatus and test crew necessary for determining the steam rate by using indicators.

It is obvious that where a complete test by taking indi-

[1] Abstract of a paper contributed by the Railroad Division and presented at the annual meeting of the American Society of Mechanical Engineers, December 3, 1935.

[2] Research engineer, the Superheater Company.

[3] "Some Experimental Results From a Three-Cylinder Compound Locomotive," by Lawford H. Fry, Proceedings, Institution of Mechanical Engineers, 1927, vol. 2, p. 923.

[4] "Heat-Power Engineering," by Barnard, Ellenwood and Hirshfeld.

cator cards would not be justified, a test using the heat-drop method can be run with a low expenditure, and the various design features which influence cylinder performance can be studied as often as desired.

The following design features are commonly in question:

(1) Boiler pressure, since it controls the pressure in the steam pipe.
(2) Throttle and dry pipe. The pressure drop through these affects the pressure in the steam pipe.
(3) Steam temperature in the steam pipe, and superheater design.
(4) Size and design of valves and cylinders.
(5) Valve setting.
(6) Exhaust nozzle, both size and shape.

The necessary readings for obtaining the steam rate can be taken at frequent intervals, so that a complete picture is easily obtained of the locomotive performance at various speeds and rates of working. Even when tests are being made on the combustion efficiency of, and heat transfer in, the boiler, it is desirable to measure the steam rate and cylinder efficiency, so that the results may be more closely analyzed.

Methods of Measurement and Sources of Error

The instruments used in measuring temperature and pressure should be as accurate as possible and suitable for use in road tests on locomotives. In order to obtain a better understanding of the relation between errors and accuracy, Fig. 1 has been prepared. In this figure the four curves show the effect of errors in measure-

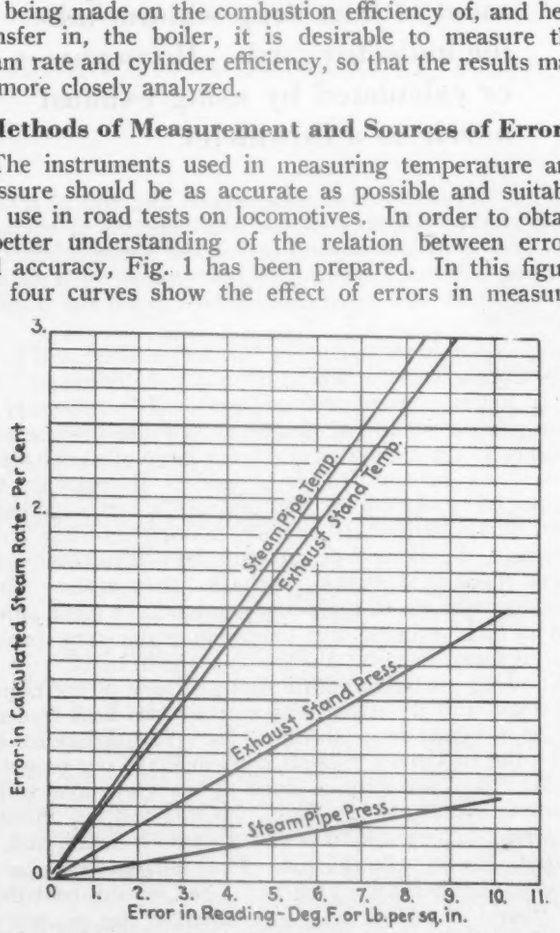


Fig. 1—Effect of errors in readings on calculated steam rate

ment of the steam-pipe temperature, steam-pipe pressure, exhaust-steam temperature, and exhaust-steam pressure, on the steam rate. An error of 2 lb. per sq. in. in measuring the steam-pipe pressure will cause an error of 0.1 per cent in the calculated steam rate. An error of 1 lb. per sq. in. in the measurement of the exhaust pressure will cause an error of 0.14 per cent in the steam rate. To measure the steam-pipe pressure to within 2 lb. per sq. in. and the exhaust pressure to within 1 lb. per sq. in. calls for only reasonably accurate test gauges. It may be necessary to make a correction for the hydrostatic head, due to the water in the pipe connecting the pressure gauge and the point where it is tapped into the steam pipe or exhaust pipe.

Measurement of steam-pipe and exhaust-steam temperatures calls for more careful consideration. If they can be measured with a maximum error in each of 1 deg. F. the resulting error in the steam rate will be 0.68 per cent. If measured with a maximum error in each of 2 deg. F. the error in the steam rate will be 1.35 per cent. Adding to these figures the errors due to steam-pressure measurements gives a total error of 0.92 per cent if temperatures are measured to within 1 deg. F. and 1.59 per cent if measured to within 2 deg. F.

The apparatus described has been used with good results. It is not meant to infer, however, that this is the only apparatus suitable for measuring temperatures to within 1 or 2 deg. F. Other means will be mentioned.

Temperatures are measured with thermocouples constructed as shown in Fig. 2. Wires used are iron and constantan, purchased in lengths. Samples of each

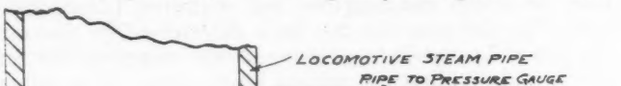


Fig. 2—Steam-pipe thermocouple and pressure-gage connection

length are calibrated, with reference to a thermometer certificated by the Bureau of Standards. The wires are led through porcelain insulators to a steel plug welded in the end of a piece of ¼-in. pipe. The wires are brought through small holes drilled in the steel plug, bent over, and, the ends covered with silver solder. This gives a thermocouple which is tight against steam pressure and will follow any change in temperature rapidly. The thermocouple is screwed into a socket which, in turn, is screwed into the steam pipe. This gives a steam space surrounding the thermocouple all the way up to the thermocouple head, which serves to minimize any errors due to conduction along the thermocouple pipe. The steam pipe thermocouple illustrated in Fig 2, is screwed into the steam pipe in any convenient place.

The exhaust-steam temperature is measured, not in the exhaust passage, but in the exhaust stand. It has been the common practice in the past to measure the exhaust-steam temperature in the exhaust passage close to the steam chest. This has been standard practice on the Pennsylvania in the tests at Altoona on the locomotive test plant. It is stated in several of the road's publication's that the exhaust-steam temperature measurements are believed to be higher than the true temperatures. The reason given is as follows:

During admission of the steam into the cylinder, heat is transferred from the steam to the cylinder walls and head. As the steam expands and becomes cooler this heat transfer stops and then reverses, so that during the exhaust stroke heat is being transferred from the cylinder to the exhaust steam. After release, when the pressure in the cylinder is higher than the average exhaust pressure, there occurs a sudden rush of steam, which by reason of its high velocity does not have time to absorb very much heat from the cylinder walls. As the piston moves on the exhaust stroke the steam, which is now moving more slowly, is heated up by the cylinder walls, with a rise in temperature.

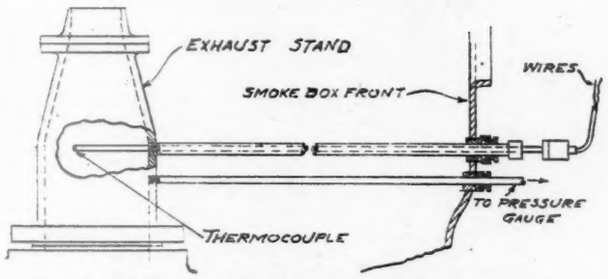


Fig. 3—Exhaust-stand thermocouple and pressure-gage connection

It is stated that the investigators believe the sudden rush of relatively cool steam at release does not register properly on the thermometer in the exhaust passage and that this thermometer is influenced more by the slow-velocity high-temperature steam during the exhaust stroke.

In measuring any fluctuating steam temperature it is desirable to provide for as much mixing of the steam as possible. Accordingly, the exhaust-steam thermocouple is located in the exhaust stand so that the steam passes through a chamber of some volume and with several bends before the temperature is measured. Also a thermocouple applied in one side of the exhaust stand will measure the temperature of the exhaust from both ends of one side of the engine, and the thermocouples applied in both sides of the exhaust stand will measure the exhaust-steam temperatures from all four ends of the locomotive cylinders.

The accuracy of the assumption that better temperature measurements could be made in the exhaust stand than in the exhaust passage was tested on a locomotive in main-line service. On this particular test an observer was riding on the front of the locomotive and simultaneous readings were taken of the exhaust-steam temperature with a thermometer in the exhaust passage close to the steam chest, and a thermocouple in the exhaust stand. The average of a number of readings showed the observed exhaust-passage temperature, as indicated by the thermometer, to be 345 deg. F. and the observed exhaust-stand temperature, as indicated by the thermocouple, to be 325 deg. F. In other words, if the exhaust-stand temperature is taken as being accurate the temperature measured in the exhaust passage close to the steam chest was reading 20 deg. high. This figure would vary no doubt with the class of engine and conditions of working, but it is evident that measurements taken of the exhaust-steam temperature in the exhaust passage close to the steam chest are subject to considerable error.

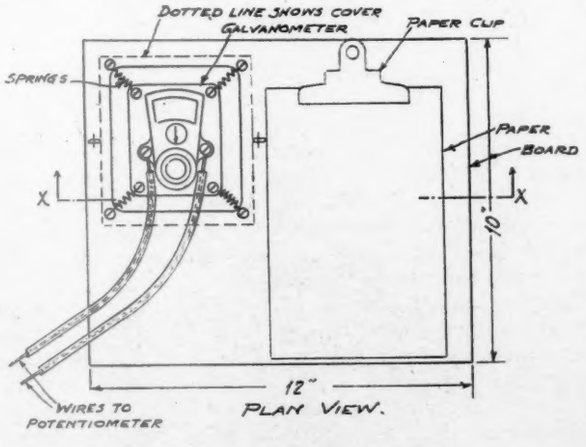


Fig. 4—Galvanometer mounting and data board

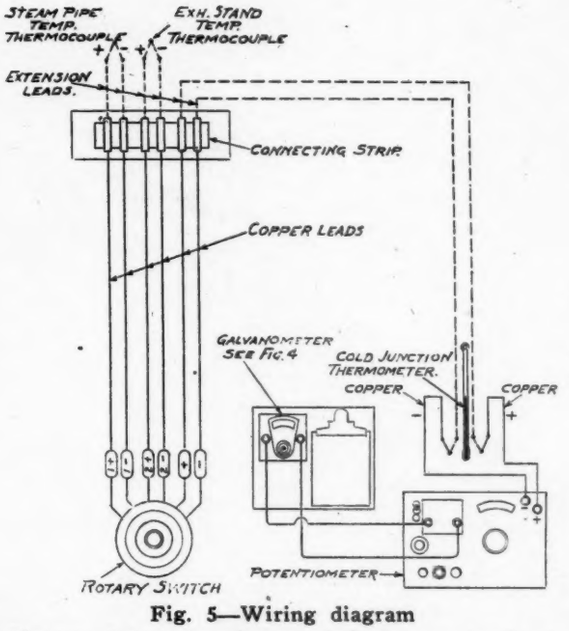


Fig. 5—Wiring diagram

The application of the thermocouple—constructed the same as in Fig. 2—to the exhaust stand is shown in Fig. 3. A ½-in. standard pipe is screwed into the exhaust stand and brought out through the smokebox front. The thermocouple is slid into this ½-in. pipe, which provides an insulating jacket and also permits easy removal.

The thermocouple electromotive force is measured with a Leeds & Northrup potentiometer, a well-known means of measuring temperatures in connection with thermocouples, and suitable for locomotive testing. Because of severe vibration there is always the possibility of a broken strand in one of the thermocouple wires, or a bad contact. With a direct-reading pyrometer this would throw the instrument off but with a potentiometer it would make no difference, as long as the wiring was good enough to provide a circuit.

With the galvanometer mounted in the potentiometer case as sent out by the makers, the vibration of the locomotive is sufficient to upset the galvanometer needle. In order to obviate this difficulty, the galvanometer is mounted on a board with a spring suspension as shown on Fig 4. This board, held by the observer, also serves for writing down the data. The observer's body will absorb most of the shocks from the vibration of the locomotives and, with the spring mounting of the galvanometer, no trouble will be found in taking readings. The potentiometer is mounted on a bracket and the galvanometer wired to the potentiometer by means of two copper wires of sufficient length to allow freedom of movement to the observer.

The thermocouples are connected to a rotary switch in the cab by means of which each one in turn may be put into the potentiometer circuit. The wiring diagram is shown in Fig. 5. A thermocouple measures the difference between the temperatures of the hot and cold junctions and consequently it is necessary to know the temperature of the cold junction and to connect the hot and cold junction in such a way that no other electromotive force is set up. As in Fig 5, the thermocouples

are connected with special extension leads to a connecting strip located at some convenient spot near the front of the locomotive. These extension leads are of the same material as the thermocouple wire, so that no electro-

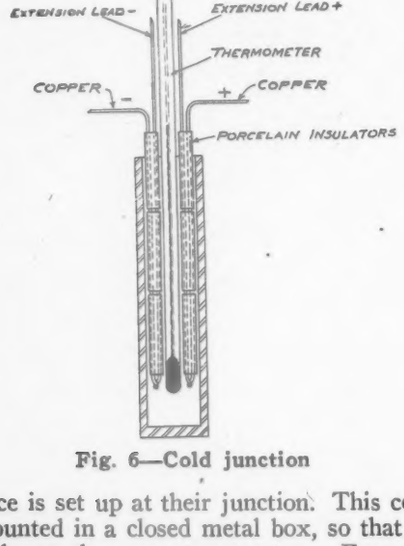


Fig. 6—Cold junction

motive force is set up at their junction. This connecting strip is mounted in a closed metal box, so that all junctions will be at the same temperature. From the connecting strip copper leads are run to the rotary switch in the cab. The common wires from the rotary switch, which are connected to each thermocouple in turn, are connected with copper leads forward to the connecting strip and from there connected with the special extension leads back to the cab. The ends of these leads are joined to copper wire, which is connected to the potentiometer. This junction of the extension lead and the copper wire forms the cold junction, Fig. 6, and is placed in a piece of ¾-in. pipe. The thermometer and cold junction will be at the same temperature and will not be affected by stray air currents. As many thermocouples as desired can be wired with extension leads to the connecting strip at the front of the engine and the single extension lead going back to the cold junction will automatically refer the cold junction from the connecting strip to the cab.

For accuracy in measuring the steam rate it is desirable to have thermocouples in both steam pipes and both sides of the exhaust stand. The temperatures should not vary much from side to side, but with the two sets of thermocouples a true average can be obtained.

Instead of using thermocouples the temperatures can be measured with even greater accuracy by using platinum resistance thermometers.

It has already been pointed out the heat drop from the steam pipe to the exhaust includes radiation from the steam pipes, steam chests, cylinders and exhaust passages. For a typical 4-6-2 type locomotive, this radiation loss has been calculated to be approximately 0.42 per cent of the heat drop with the engine standing still and 0.83 per cent of the heat drop with the engine running at 100 mph. This radiation loss can be allowed for, but it is obvious that inaccuracies in its determination will be negligible in its effect on the calculation of the steam rate.

Road Tests of Locomotives

Table I shows the results obtained on road tests of a 2-8-2 type locomotive in fast freight service. The object of the test was to determine the effect on the engine performance of a special design of superheater unit. Tests, Nos. 1-12, were first run with the standard Type A superheater in place. The special superheater was then installed in place of the Type A and further tests,

Table I—Test of 2-8-2 Type Locomotive

Test No.	Tonnage	Speed m.p.h.	Cutoff, per cent	Steam pressure: Steam pipe, lb. per sq. in.	Steam pressure: Exhaust, lb. per sq. in.	Temperature: Steam pipe, deg. F	Temperature: Exhaust steam, deg. F	Steam rate, lb. per i.hp.-hr.
1	3779	30.7	44	149.9	11.2	641	318	17.59
2	3879	24.0	48	149.0	12.6	639	327	18.13
3	2016	42.4	40	147.7	12.5	597	291	18.62
4	3000	28.8	49	145.7	12.2	644	325	17.80
5	3532	27.8	48	144.2	11.4	628	318	18.34
6	2690	32.0	43	142.5	12.7	635	325	18.21
7	2629	34.3	42	142.9	12.5	633	320	18.09
8	2699	30.6	46	149.2	13.0	625	314	18.41
9	2819	29.3	44	144.4	13.3	621	306	18.22
10	3760	27.6	45	154.8	12.6	641	318	17.58
11	4200	27.3	46	155.7	12.6	632	306	17.40
12	3476	33.3	42	147.3	12.5	642	327	17.93
Avg.	3207	30.7	45	148.0	12.4	632	316	18.03
13	3637	29.8	49	159.2	13.0	707	357	15.80
14	3718	28.5	49	157.7	12.8	724	365	15.39
15	3680	33.4	47	165.5	9.7	710	354	15.68
16	3701	30.8	47	162.7	12.0	683	348	16.69
17	2966	28.1	49	164.0	13.0	716	367	15.87
18	2623	31.9	47	162.3	14.2	705	379	16.97
19	2660	38.0	47	156.7	14.3	692	352	16.40
20	3067	37.2	45	164.7	11.6	689	334	15.84
21	3789	31.4	47	161.1	12.4	680	347	16.92
22		32.0	45	160.4	11.2	677	357	17.53
23		36.9	43	163.7	10.0	666	347	17.71
24		37.6	47	159.8	14.5	718	395	17.21
25		29.8	45	159.4	12.4	712	375	16.48
26	2580	36.6	46	157.0	14.1	680	362	17.62
27	3670	26.3	55	156.8	14.0	690	367	17.21
28	3400	31.6	49	155.3	13.3	676	355	17.61
29	3382	27.7	48	160.3	11.3	693	354	16.48
30	4112	30.8	48	162.7	11.9	681	351	17.02
31	3354	31.7	48	162.7	13.5	690	357	16.79
32	2754	37.4	43	161.9	11.8	675	350	17.38
Avg.	3318	32.4	47	160.7	12.6	693	359	16.73

1—Tests 5 and 12 were made with 90 per cent throttle opening. All other tests were with full throttle.
2—For tests 1-12 boiler pressure averaged 16.3 lb. higher than steam pipe pressure and for tests 13-32 the average was 22.4 lb. higher.

Table II—Test of 4-6-2 Type Locomotive

Test No.	No. of cars	Tonnage	Cutoff, per cent	Pressure: Steam pipe, lb. per sq. in.	Pressure: Exhaust, lb. per sq. in.	Temperature: Steam pipe, deg. F.	Temperature: Exhaust, deg. F.	Steam rate, lb. per i.hp.-hr.
1	5	571	25	202	11.6	700	356	16.47
2	5	573	25	205	11.6	715	354	15.60
3	5	573	27	207	12.5	709	343	15.41
4	5	571	25	210	12.9	705	355	16.19
5	6	644	25	207	12.4	691	339	16.18
6	6	636	26	205	13.2	711	359	16.00
7	5	569	25	205	10.9	699	337	15.61
8	5	558	25	211	12.5	719	360	15.69
Avg.	..	587	25.4	207	12.2	706	350	15.89
9	6	643	25	213	11.4	748	360	14.37
10	6	643	26	211	11.5	749	359	14.28
11	6	644	25	214	10	748	356	14.21
12	7	715	26	213	13.6	749	371	14.79
13	6	643	25	210	13.0	748	362	14.40
14	6	643	26	209	13.3	745	358	14.38
Avg.	..	655	25.5	212	12.1	748	361	14.41

Nos. 13-32, were run. No attempt was made to obtain special conditions with reference to the running. The engine was in regular service, pulling whatever trains were assigned to it with various engine crews. The locomotive would run for half a division, take on water, and then finish the run to the end of the division. Each test shown in Table I is the average of readings taken every two miles for about 40 to 50 miles, representing about half a division. After starting, several miles were allowed before readings were commenced in order that conditions might become reasonably constant. A caboose was carried back of the locomotive as a test car. The thermocouples were all wired to the caboose, where the temperatures were read by an observer with the potentiometer and rotary switch. The wiring connection between the caboose and tender was arranged to be easily connected and disconnected. Temperatures were measured on the left side only.

The method of testing was successful and the readings obtained were consistent and reasonable. The increase in steam temperature with the special type of super-

heater showed a decrease in steam rate, in line with other tests. This will be referred to later, when the accuracy of the heat-drop method is discussed.

Table II shows the results obtained in a similar test on a 4-6-2 type locomotive in fast passenger service. In this case temperatures were measured in both steam pipes and in both sides of the exhaust stand. The variation from side to side was not very great, but was enough to be significant. The potentiometer and rotary switch were mounted in the cab and even at the highest speeds the galvanometer mounting shown in Fig. 4 was satisfactory. As in the test records in Table I the increase in steam-pipe temperature showed a decrease in steam rate, as would be expected. The readings of the steam-pipe temperature, exhaust-stand temperature, and steam rate are more consistent than those shown in Table I. This is because the weight of the train did not vary much. Only two crews were used for all the tests, and the time-table schedule was kept more closely.

Accuracy of Heat-Drop Measurement of Steam Rate

It is difficult to estimate the absolute accuracy of the steam rate as determined by the proposed method. In a number of tests, particularly those made at the Altoona testing plant of the Pennsylvania, measurements were taken of the exhaust steam temperature. This temperature was always measured in the exhaust-steam passage close to the steam chest, and, as already pointed out, the readings cannot be taken as being accurate. Consequently, it is not possible to compare the steam rate as obtained in these tests from the heat drop and as obtained from the indicator cards, except in a general way.

Some idea of the possible accuracy of the heat-drop method can be obtained from Fig. 7. In this figure steam rate is plotted against temperature in the steam pipe. Curve 1 is taken from Pennsylvania bulletin No. 24, published in 1914, entitled "Superheater Tests," the tests described being made on a Pacific-type locomotive. The only changes throughout the test were the length and arrangement of the superheater units. All points shown on Curve 1 are for a constant cutoff of approximately 40 per cent and a consistent speed of approximately 240 r.p.m. The steam-pipe pressure varied from 170 to 195 lb. Curve 2 is plotted from the results given in Table I. These tests were run at approximately 45 per cent cutoff, with a steam-pipe pressure of from 145 to 165 lb.

On account of the lower steam-pipe pressure it would be expected that Curve 2 would lie above Curve 1, showing a higher steam rate for the same steam temperature. The general trend of Curve 2 is the same as that of Curve 1. Another measure or indication of the accuracy of the results is the scattering of the points about the average line. It must be remembered that the tests for Curve 1 were made on a stationary test plant, with speed, cup-off, and horsepower closely controlled. The tests for Curve 2 were made in regular service, with a large variation in speed and tonnage, and with a number of different

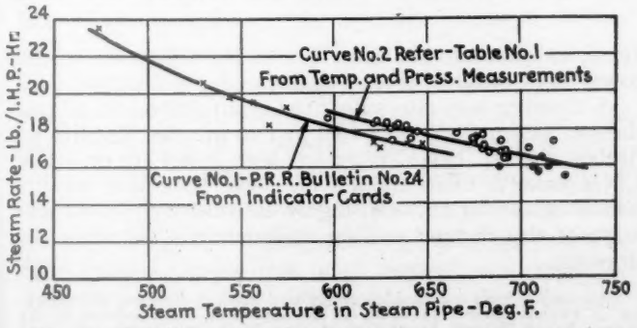


Fig. 7—Relation of steam rate and steam temperature

crews operating the locomotive. In view of this it is thought that the scattering of the points for Curve 2 compares favorably with the scattering for Curve 1.

Measurement of Indicated Horsepower

It was pointed out by L. K. Botteron, in the *Railway Mechanical Engineer*, July, 1930, that the exhaust nozzle of a locomotive could be considered as a flowmeter. From the exhaust pressure and temperature the velocity of the steam in the exhaust nozzle tip can be determined. Using the connections for pressure and temperature as shown in Fig. 3, it is necessary to apply a correction for the velocity of the steam at the point where the pressure is measured. The usual formula for determining the velocity of steam in a nozzle is

$$V_2 = 223.7\sqrt{H_1 - H_2} \quad [1]$$

where V_2 = outlet velocity, ft. per sec.
H_1 = inlet heat content, B.t.u. per lb.
H_2 = outlet heat content, B.t.u. per lb.

In order to allow for the velocity of the steam at the point where the pressure is measured it is necessary to use the more exact formula

$$\frac{V_2^2 - V_1^2}{2g} = 778\,(H_1 - H_2) \quad [2]$$

where V_1 = inlet velocity, ft. per sec.

From a knowledge of the pressure and temperature in the exhaust stand the quantity H_1 is determined. From a Mollier diagram the quantity H_2 is obtained, since the steam expands adiabatically and the entropy is the same at points 1 and 2. The pressure at point 2 is the pressure in the smokebox, and from the entropy and pressure the specific volume can be determined. Since the same weight of steam is flowing by points 1 and 2, the relation between V_1 and V_2 is

$$V_1 = V_2 \times \frac{A_2}{A_1} \times \frac{v_1}{v_2} \quad [3]$$

where A_1 = area of exhaust stand where pressure is measured, sq. ft.
A_2 = area of exhaust tip, sq. ft.
v_1 = specific volume at inlet, cu. ft. per lb.
v_2 = specific volume at outlet, cu. ft. per lb.

Substituting this value of V_1 in equation [2] gives

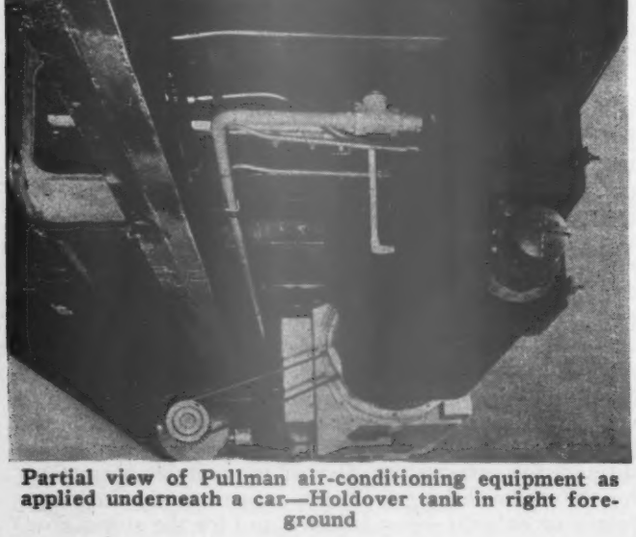
$$\frac{V_2^2\left\{1 - \frac{A_2 v_1}{A_1 v_2}\right\}^2}{2g} = 778\,(H_1 - H_2) \quad [4]$$

from which V_2, or the velocity in the exhaust tip, can be calculated. The flow of steam through the exhaust tip is equal to the velocity multiplied by the area, multiplied by the density, multiplied by a coefficient. It was assumed in the article by Botteron that this coefficient would be unity. Using this assumption the author has obtained some results which agreed fairly well with the measurement of water from the tender tank. It is felt that for better accuracy it would be desirable to calibrate the exhaust tip by means of a standing or blowdown test. It would be possible for any railroad to establish the coefficient for their design of exhaust tip and then to use the exhaust-stand pressure and temperature measurements to give accurate readings of the flow of steam through the exhaust tip. By making suitable corrections for the steam flowing from the exhaust to the feedwater heater or exhaust-steam injector and for the steam flowing from the auxiliaries to the exhaust passage the weight of steam to the engine can be calculated with fair accuracy. These readings would give the flow of steam to the engines at any instant during a run. When the steam rate is known, as obtained from the heat-drop measurements, the indicated horsepower, at any instant, can be obtained by dividing the steam to the engines by the steam rate. This enables the indicated horsepower to be determined by measuring the temperature and pressure of the steam in the steam pipe and in the exhaust stand.

Pullman Air-Conditioning Holdover Feature

THE direct mechanical air-conditioning system, supplied by the Pullman-Standard Car Manufacturing Company, is designed to meet the full air-cooling requirements when train stops are frequent and stand-by power is available at terminals. To meet the condition of exceptionally frequent or long stops and inconvenient or inadequate stand-by power at terminals, an exclusive Pullman holdover feature has been developed and installed, as shown in the illustration. This consists essentially of a holdover tank from which an inexpensive solution of non-corrosive, non-poisonous liquid is automatically circulated through a coil adjacent to the evaporator whenever the train stops and the temperature would otherwise rise in the car. When the compressor is not cooling directly, it freezes ice out of this solution into horizontal ice columns. If the temperature rises in the car due to lack of power to operate the compressor, the cold liquid surrounding the ice columns is automatically circulated through a cooling coil by a thermostat which actuates a 32-volt motor-driven pump.

With the axle-driven compressor operating at full capacity it is possible to charge the holdover tank in 1¼ hours. The tank will then provide a cooling capacity which is about equal to that obtained by operating the compressor by a 12-hp. motor, which receives its power from a 1,000-ampere hour storage battery, starting at full charge and running until the automatic cut-off disconnects the motor at 27.5 volts. This amounts to a little more than half the total capacity of the storage battery. The remaining capacity is usually withheld from the compressor motor to provide insurance for car lighting and other auxiliaries.



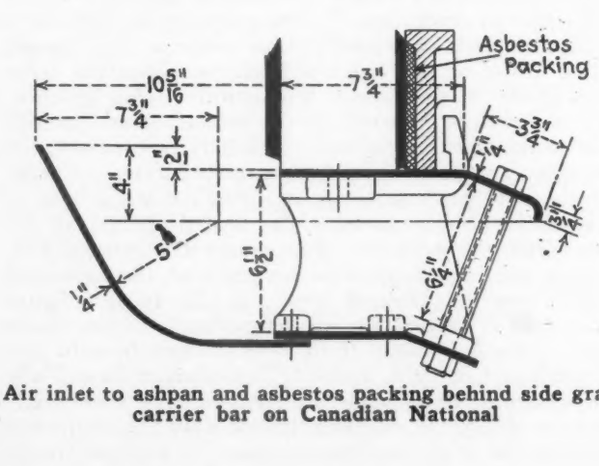
Partial view of Pullman air-conditioning equipment as applied underneath a car—Holdover tank in right foreground

This thermal storage unit of the Pullman system is simple and positive in operation, and can be repeatedly charged and discharged without detrimental effect. It is charged during the time when compressor operation is not required for cooling or in the yards before train departure. It is said to require little maintenance as the only moving parts are a small motor-driven pump and the control switches.

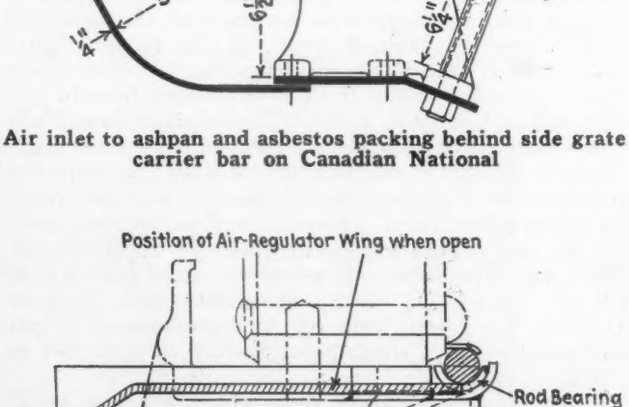
The holdover tank proves its value especially on runs with long stops, being automatically recharged enroute between stops. Continuous cooling is thus provided, as the compressor functions above 8 to 10 miles per hour and the holdover handles the cooling at speeds below this point and during stops. The Pullman direct mechanical system with the holdover feature is designed to afford maximum economy in producing continuous cooling and this method of storing energy is exclusively a Pullman feature.

Air Inlets To Ashpans*

THE Canadian National, which operates in severely cold districts, reports the use of an air deflector in conjunction with the ashpan. This deflector is bolted to the bottom of the mud ring. Its function is to deflect the cold air from the side sheet to a point where it must pass through the fire. This road also reports a method of packing the space behind the side grate carrier bar with asbestos, as shown in one of the illustrations, to eliminate the corrosion of the side sheet at the lower area caused by the products of combustion.



Air inlet to ashpan and asbestos packing behind side grate carrier bar on Canadian National



Automatic ash pan damper on C. & O. locomotives

A drawing was also submitted of an automatic ashpan damper designed to save fuel and to increase the life of firebox sheets. This damper has been in service on a few Chesapeake & Ohio engines for some time with results which have thus far been highly satisfactory. The operation of this damper will be easily understood from the drawing.

* Abstracted from a committee report on "Staybolt Leakage and Cracking of Firebox Sheets" submitted at the September, 1935, meeting of the Master Boiler Makers' Association, as given in the proceedings published in the October, 1935, issue of the Boiler Maker and Plate Fabricator.

EDITORIALS

1936
"Forward!" "March!"

"Why attempt to do something the 'Boss' does not want you to do?" Thus writes an officer of one of the so-called minor mechanical associations in reply to a suggestion that special efforts be put forth to revive the work of the association. Fortunately for the railroads, this is not the spirit in which most of the officers of the mechanical associations are facing the situation. The messages in the early part of this number clearly demonstrate this.

Far be it from the purpose of the *Railway Mechanical Engineer* to advocate that any supervisor or officer should seek a quarrel with his boss. Obviously any effort to press the necessity for promoting association activities should be conducted with tact and diplomacy. This is particularly true if it is known that the boss has a strong bias in the matter. On the other hand, a real boss, if he has administrative ability, can have nothing but contempt for yes-men. In large organizations there is always an inclination toward bureaucracy; this, in turn, is likely to encourage the development of yes-men—a tendency which has the same effect in eating into the vitality of an organization as has cancer in the human body.

If those who are heading up the mechanical associations really believe in them, and comprehend the good that can come from them, if properly conducted, then surely they can vigorously press the needs of these organizations in an intelligent way, which will not antagonize their superiors.

Difficult Problems To Be Overcome

Business conditions have very considerably improved in recent months. This is clearly reflected in increased traffic for the railroads and in improved net earnings. While it is unwise to attempt to prophesy, there seems to be little question but what these improved business conditions will continue well into the year, unless some great catastrophe takes place.

With a revival of business the railroad managements face many complicated and intricate problems. Very little new equipment or facilities have been installed for a number of years. Maintenance has been deferred wherever possible. Even under normal conditions this marking of time in improving equipment and facilities and in deferring maintenance would be serious. Added to it, however, we find that radical changes have taken place in the field of transportation during the years of depression—changes that may require new types of equipment, different sorts of facilities, and possibly radical changes in operating methods.

How are the railroads equipped to face this situation? Obviously, the most important factor is a well organized and trained supervision and personnel. The past five or six years have seen drastic reductions in the number of employees and this has also been reflected in the supervision. Younger men have been largely eliminated from the organizations and training methods have been slowed up, if not entirely abandoned. Many of the older men have left the service and the railroads will be hard put to it if within a short period they have to tackle a greatly increased business and reorganize and add to their forces.

A Question of Supervision

The mechanical department has been particularly hard hit and faces a serious situation, so far as supervision and personnel are concerned. Obviously, as conditions continue to improve, drastic steps must be taken to strengthen the supervision and to see that it is properly educated and coached. This problem may be tackled in different ways, depending upon the local conditions, but one of the most important factors in inspiring and setting a pace for better supervision will be by encouraging the activities of the highly specialized mechanical-department associations. Most of these organizations have splendid records of achievement behind them. Because of economic conditions they have been allowed to lie dormant for several years. Happily, in most instances their executive committees have functioned sufficiently so that, at the very least, the officers are still on the job. True, there has been a falling off in membership and the morale has been largely shot to pieces.

Mechanical Associations Should Be Revived

The revival of these associations, now that things are on the up-grade is, we believe, of extreme importance in assisting the railroads to inspire and develop their supervisory staffs. This, primarily, is the reason for using so large a part of this number of the *Railway Mechanical Engineer* for messages from the leaders of the various mechanical associations.

In a broad way these messages indicate some of the values of these associations. It is true that they do not attempt to discuss the advantages in detail, nor are the expressions the result of any thorough research. A study to determine the exact values of these associations would require more time and space than are available. It may not be out of place, however, to recite several incidents which are typical and which will give some idea of the different ways in which they may be helpful.

Examples of Helpfulness

The superintendent of a large railway repair shop had worked his way up from the ranks. He had a strong personality and real ability, and apparently was making good on the job. In some way, possibly at the suggestion of some of his friends, he attended a meeting of one of the so-called minor mechanical associations. He was pretty well along in years, was well satisfied with the job he was doing, and quite apparently attended the meeting only at the insistence of some of his acquaintances and without knowing exactly what it was all about and what he might expect from it. One of his friends frankly made the statement that he "didn't think the old man would get much out of it," because he was doubtful as to whether, with his extremely limited experience on one road, he would really be open-minded enough to take advantage of any suggestions which were developed.

When the shop superintendent went home after the convention things happened in his shop. He never missed another convention as long as he remained actively in service, and his shop became recognized as one of the very best of its type. It would be difficult or impossible to estimate the amount of money that his company saved by his improved performance.

A graduate of an engineering college served an apprenticeship on a midwestern railroad and eventually was made a roundhouse foreman. It was a 12-hour day, seven-days-a-week job. His college training had impressed him with the importance of making wide contacts and he insisted upon attending a convention of one of the minor mechanical associations. Incidentally, he had to do it on his own expense, but he was ambitious and fighting to get ahead, and felt that the sacrifice was worth while. He came back to the job all fired up, and with renewed energy and more intelligent effort made a record which so increased his value to the railroad that he was pushed rapidly ahead.

Another man, still fairly young, came into a minor supervisory position, working himself up from the ranks and having only a limited education. A wise mechanical department superintendent felt that the young man's value to the company could be greatly increased if he was given the opportunity of coming in contact with men in similar positions on other railroads, and in broadening his contacts. This man today holds an important position as a higher officer and acknowledges that the inspiration and help that he received from the conventions and the friendships there made, were an exceedingly important factor in fitting him for his present position.

An expert in one branch of the mechanical department, whose name is favorably known throughout the country, started many years ago on a western railroad as a fireman and worked his way up until he is today respected as an authority in the work in which he has since specialized. You will find him religiously attending meetings and conventions of experts from other railroads. Indeed, he insists that these contacts and exchanges of opinion are of vital importance, in order that he may keep up with the progress that is being made in his particular field. On a cold-blooded, statistical basis, the savings that have been made over the years on his road and in his department would present an astounding figure.

One might go on at great length with incidents of this sort. The minor mechanical associations do not duplicate the work of the Mechanical Division in the way of preparing standards and recommended practices. They deal, rather, with highly specialized problems in the different branches of the mechanical department, which are more or less continually changing because of the introduction of new equipment or changed operating practices. Members meeting with their associates from other roads, and debating with them, are kept up to date. Moreover, they know where to go when they get into difficulty and need advice, or wish to compare notes with men in like positions. Mechanical department supervisors, when they start for a convention, have certain specific problems that they are trying to solve; checking up with their fellows in the meetings, or outside of them in informal conversation, frequently leads to the solution of these problems.

Selling the Boss

The mechanical associations, rightly conducted, can be a tremendous asset to our railroads. No one knows better the value of these organizations than the supervisors who are interested in them and know how to use them. If the bosses do not appreciate these associations, then surely the supervisors can find some way of tactfully and diplomatically selling them to their superiors. Remember that your boss, if he is a real executive, does not want to be surrounded by yes-men.

An engineering college graduate, after several years of experience in the shop and in the designing room, went to another road as the mechanical engineer. He reported to a wise, hard-headed superintendent of motive power who had come up from the ranks and had never had a technical training. The mechanical engineer had an uncomfortable time of it, because he had literally to fight for almost every improvement that he wished to make in the design of the equipment. Frequently he grew discouraged and wondered whether, after all, it was worth while trying to make improvements. After a few years he resigned to go to another position.

Much to his surprise, the superintendent motive power expressed profound regret at his leaving. The mechanical engineer pointed out that a man had been in training under him, who could fill the position acceptably—indeed was a better engineer than he was. The S. M. P. replied, "Yes, maybe that is true, but he won't fight with me to get his ideas over. I have never had the advantage of a technical training and the only way in which I can check up on you technical men is to force you to fight to get your ideas over." Incidentally, this superintendent motive power had the

reputation of being one of the best on a road of its size in the country.

The above incident is cited in no disrespect to the S. M. P. No matter how well trained any officer of a railroad may be, he cannot be expected to understand all of the details in the great variety of activities under his general direction. The railroad mechanical department is so extensive in its variety of work that many specialists are required to head up the different types of activity. The officers, therefore, must have under them supervisors that they can trust and in whom they have confidence. In turn, however, these supervisors must intelligently, but persistently, in a diplomatic way, press their claims and see that the higher officers thoroughly understand all that is involved in their requests for support. This cannot be done by making broad or general statements; the supervisor must present his problems in a concise, intelligent way. He must be prepared to support his requests with sound logic and pertinent facts.

Executives' Point of View

A wise chief executive of a railroad demonstrated this quite conclusively at a meeting of one of the railroad clubs. A speaker had made a strong claim for certain improvements which he advocated in the mechanical department. In the discussion the chief executive said that he realized that such improvements were necessary, but did not believe the managements should be criticized quite so strongly for not adopting them. He pointed out that the chief executive had only a certain amount of money to spend for new facilities and improvements and that all the department heads were making requests for increases in their budgets or for capital expenditures. The chief executive, therefore, had to place the available funds where they could make the greatest improvement and earn the greatest return. It was, explained the chief executive, up to each department officer so to present his claims that they would receive proper recognition. If his department could really make better use of the money than other departments, then it was his failure if he could not get the fact over to the chief executive.

"Why attempt to do something the 'Boss' does not want you to do?" Possibly the boss's failure to recognize the importance of the claim is a measure of your inability to point out the importance of your association and its possibilities in the way of increased earnings for the railroad.

Objections to Convention Attendance

What are some of the objections made to convention attendance? In recent years, of course, the principal one has been the expense of attending such meetings. This, however, for a railway employee, is not very great, compared with men in similar positions in other industries. The railroad man has his transportation and the other costs need not be very high. Based on expenditures for other purposes it would seem that it must be a pretty poor convention, or a poor man attending it, if it could not many times justify the comparatively small expense involved. The time away from work is also one of the criticisms, but in a properly organized department this surely can be overcome.

Possibly the real reason why some of the higher officers look askance at conventions is that they believe they are big sprees. This contention surely is a severe indictment of the ability of the higher officers to select the right kind of men for supervisory positions. It must be admitted that some few men may not behave themselves as well as they might at conventions. The percentage of such men, however, is extremely small, and any one who has attended the conventions and followed their activities critically cannot but be impressed with the way in which the members participate in the proceedings and work hard to get everything they can out of them. If anything, a mistake is made in some instances in attempting to hold too long sessions each day.

Under the circumstances, can the railroads afford to eliminate so important a factor in the interests of efficiency and economy, because a few, or extremely small percentage of the members, do not know how to use the conventions properly?

There is a possibility, with the changes that have taken place in maintenance-of-equipment operations in recent years, that some of the associations may have failed to live up to their best opportunities, or have not been sufficiently keen in adapting their programs to the changing conditions. It would not be surprising if this were true in some degree, although one must admit, after studying the past performances of most of the associations, that they have been fairly successful in adjusting themselves to changing requirements.

With the long let-down it may be difficult for them to reorganize quickly to meet the new conditions. They may not be perfect and they may have shortcomings, but would it not be far better intelligently to encourage and help them, rather than to let their officers get the impression that they are not needed, or are not wanted?

NEW BOOKS

MECHANICAL WORLD YEAR BOOK. *Published by Emmott & Co., Ltd., 31 King Street West, Manchester, England. 360 pages, 4½ in. by 6½ in. Price ⅙ net.*

The 1936 edition of the Mechanical World Year Book includes, in addition to the various sections devoted to mechanical data on boilers, compressors, pumps, condensers, improved sections on machine tools and metals and alloys. A new section which has been included for the first time in the 1936 issue deals with the strength of tubes, cylinders and pans subjected to external pressure. This section has been included to meet the demand for information on equipment used for steam heating and contains many useful formulas bearing on this type of equipment.

THE READER'S PAGE

Alloy Steels in Car Construction

To the Editor:

We have read with deep interest your editorial on "Alloy Steels in Car Construction," carried in your December issue. It strikes us that a great deal of good can come out of a discussion of this subject.

We note your comment with reference to the probability that weight reduction will be due largely to the resistance of these new materials to corrosion, and not so much to their increased tensile strength. It is our thought that the two can scarcely be separated. As a rule plain open hearth carbon steel has been stressed to around 16,000 lb., based upon its yield point of 30,000 to 35,000 lb., and now these stresses have been increased to 22,000 to 24,000 lb. when Cor-Ten has been used, based upon its yield point of 50,000 to 55,000 lb. Our experience indicates that there is a general desire to retain the full strength of conventional designs when building light weight equipment; hence, a steel having increased corrosion resistance without improved physical properties would not meet the requirements.

You also state that alloy steels cost more than carbon steel, and hence the first cost of light weight cars will be considerably greater than cars of conventional design and material. In this connection we wish to remind you of the recent announcement of the Pullman-Standard Car Manufacturing Company with reference to their welded Cor-Ten box car. Their headline that this car would be produced without added cost is significant. The added cost per pound of Cor-Ten over plain steel will not necessarily result in a higher cost for the light weight equipment.

We were happy to see this announcement of the Pullman Company because it indicates that modern design does not always demand an increase based upon the adoption of these better grades of steel. Should higher prices be asked unnecessarily, it would adversely affect the progress of the development, to the detriment of both the car builders and the producers of steel.

After giving consideration to the numerous economic factors involved in weight reduction we have come to this simple basis of reasoning: that common sense leads to the conclusion that a substantial conversion of dead weight into carrying capacity effects real savings which are bound to result in lower operating costs. This will be a complex problem only if it is made complex by specious reasoning, in those instances where it is thought necessary to justify the excessive weight of existing equipment.

We do not quite understand what was to be gained through anticipating that "no doubt in some cases the attempt at weight reduction will lead to too great a sacrifice of structural stiffness which may be the cause of expensive repairs during the life of the car." This is simply anticipating bad engineering. Perhaps there will be some bad engineering, but if so it must take the blame, not the steel used nor the fundamentals upon which the development is based. Your assumption of well balanced structures is the right and proper one, and your statement that the new materials will find justification in such designs is also right.

The final paragraph of your editorial deserves more attention than we care to give it in this communication. Some equipment should be designed with weight saving and added capacity as the most important objectives. In other cases added life and lower maintenance costs will justify the use of the new materials without reduction of section.

Let us repeat that we are glad to see editorial comment on this subject, and we are hopeful that it will precipitate a lively discussion, relating to this whole question, in your papers.

F. D. Foote,
Assistant to Vice-President,
United States Steel Corporation.

The Soviet Locomotive

To the Editor:

Many of those who are engaged in railroad work or related activities must have gotten quite a "kick" out of the description of the Russian 4-14-4 type locomotive in the November *Railway Mechanical Engineer*, and the editorial comment in the same issue.

Much water has gone over the proverbial dam since the day, in 1905, when I walked into your office for a chat on motive power. It seems to me that, even in those days, there were people who thought that the socialists ought to run the railroads—and about everything else, for that matter! They imagined that, by some hocus pocus, political radicalism could be metamorphosed into mechanical genius. I thought they were mistaken and I still do.

It is real nice of them, however, to admit today that they get ideas in the capitalistic U. S. A. This, by the way, is an interesting admission, since, by implication, it acknowledges that progress and opportunity are possible under a conservative economic and political system. Incidentally, a glance at the names of American railroad men will reveal a variety of racial origins—ample proof that merit counts and that the chance to shine is not denied to those who are willing to work.

Russia has the benefit of the accumulated experience of the most progressive industrial nations, but did very little on her own account. The idea of "mass transportation" originated among men who did not address each other as "comrade." They wanted efficiency as the means of building profitable enterprises to serve the public, reward investors and furnish livelihoods to executives and to labor. All things considered, they did very well until wild-cat motor interests invaded the highways, paying next to nothing for the privilege.

There were racketeers in the days of the Old Testament, as well as a variety of political, economic and moral theorists. It is almost startling to observe the close similarity between ancient and modern scoundrels!

The honest but untutored boy who does not know these things, sometimes falls a victim to the guile of a smooth talker who makes him believe that he would be wearing a silk stove-pipe and boiled shirt if Comrade So-and-So were in the White House. In point of fact, he would be knocking icicles off brake rigging in some remote and drafty engine house at the starvation wage decreed by Comrade So-and-So.

Arthur Curran.

Gleanings *from the* Editor's Mail

The mails bring many interesting and pertinent comments to the Editor's desk during the course of a month. Here are a few that have strayed in during recent weeks.

Treating Men Right

I have found that it is best to cultivate the confidence of each man. Let him know you are with him and want to help him, and when you are in tight places—and you will be in an enginehouse—you will not be afraid to call on him. A few men can't stand good treatment, but you can easily make exceptions of them.

"Lap and Lead"

I have seen some timely articles on valves and valve gear in the *Railway Mechanical Engineer* and have learned a great deal from them because my knowledge of valve setting is not very well rounded out. I am about like the young "hogger" who came up for promotion and in the course of examination was asked if he knew what was meant by "lap and lead." Hesitating for a moment, he replied that he was unable to give a book definition, but the old 723 would lap up more coal and lead less box cars than anything he ever "took after with a scoop."

Brake Staff on Right-Hand Side

In a pleasant chat I had today with the Division Car Foreman at ———————— I told him of a repair track foreman, who did not wish to be quoted, who said that in at least one instance he had seen a brake staff on the right-hand side of the center line of a freight car. The Division Car Foreman confirmed this from his own experience with quite old equipment. So Marinac was not so far wrong in his recent cartoon (July, 1935), which disturbed several of your readers; and the bird being a trespasser might expect to have his tail feathers spanked, say I.

Let Foremen Design Locomotives

Not so long ago I saw an engine pull away from the out track at a roundhouse about 25 minutes late, because of a cylinder cock that had gone "haywire" at the last minute. The expression on the enginehouse foreman's face indicated that he wasn't at all pleased. About the only printable thing he said was that if ever he built a locomotive he would just be damned if they put any cylinder cocks of that sort on it. Shortly thereafter I was talking to another foreman, who had put in a fretful day pushing the work on a certain locomotive equipped with a gadget of doubtful merit; I was surprised to hear him say practically the same thing my friend had said of the cylinder cock. The thought struck me that these foremen must be rather outspoken in their likes and dislikes, and wouldn't it be something to see a locomotive built according to the likes and dislikes of foremen throughout the land? The idea would be to have the foremen fill out a questionnaire, specifying the details of said locomotive from A to Z, giving the style and size of everything from the "whistle to the rail," so to speak, including his pet style of valve gear, rods, crossheads, guides, cylinders and frames, driving boxes and shoes and wedges, style of superheater, feedwater heater, and, of course, specifying the proper cylinder cocks.

The boiler foreman should be heard from also as to the details regarding flues, staybolts and type of firebox and draft appliances; and by all means let the boilermakers give us that mudring corner that won't even leak, for which we have waited so long. After the tabulation was made, do you suppose the darned thing would run?

Keep on Fighting for Business

I think it is timely to prod up the employees' traffic or "ship by rail" clubs at this time and exhort all classes of employees to renew their activities in soliciting business. There should be no let-up along this line, just because business is improving. It is a case of keeping the ball rolling and never let that old "let George do it" spirit creep into the organization.

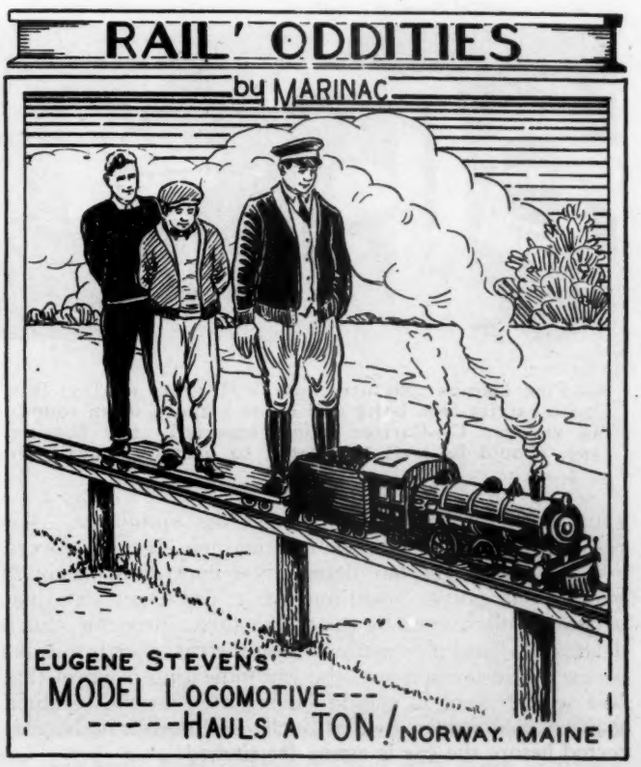
Walt Wyre Illustrations

Incidentally, I wish to congratulate you on what appears to be something of a new policy, with respect to the Back Shop and Enginehouse Department, which lends very considerable interest to the publication. It would appear that you have difficulty in finding an artist or a cartoonist who has sufficient service knowledge of mechanical matters properly to portray locomotive work, but it would seem that you have been quite successful with respect to the illustrations of Mr. Walt Wyre's story.

Traveling Fast

The London & North Eastern Railway London to Newcastle fast run is an amazing piece of work. On a trial run with the "Silver Streak," Gresley's three-cylinder Pacific made 43 consecutive miles at 100 m.p.h. and a top of 112½ m.p.h. But Mr. Gresley, like the French, will aim to maintain high uphill speeds so as to avoid much over 90 m.p.h. at any point in his run. And that is right. The French have operated on that principle for years. Of course, we are getting up into zones of pretty high averages. We talk of average speeds of 80 m.p.h. today as if it were a mere nothing. But it still takes some doing.

* * * *



For explanation see page 44

Eliminating Noises and Rough Riding of Passenger Cars

By H. K. Allen

Suggestions given for overcoming many of the conditions which cause annoyance to passengers

A FEW years ago passengers were content to accept the dust, dirt and cinders that accompanied their journey on a passenger train. They did not complain when the choking fumes from a tunnel came through the open window of their car accompanied with a shower of cinders. If they even noticed the squealing of center plates, the rattling of vestibule diaphragms or the groans from dry side bearings they probably thought of them as a necessary evil that must be expected when traveling on a train.

Within the short period of two years this has all been changed. The advent of stream-lined, air-conditioned passenger trains has convinced the traveler that a smooth, dust-free and reasonably quiet ride on a train is possible. Standard types of coaches, sleeping cars, lounge, club and diners have been placed in shops, air conditioned and generally overhauled in order to provide the same comfort and conveniences that have been provided on the newly acquired stream-lined trains. The passenger demands that this new service be furnished, the railroads have demonstrated that it can be furnished so it is now simply a matter of maintenance of the equipment. The responsibility rests with the terminal maintenance forces.

A—Pipe clamps that are loose will cause rattles; B—Loose carrier-iron bolts will cause a knock when rounding curves; C—Carrier irons, especially the floating type, should be well lubricated to prevent squeals on curves

There are numerous defects that contribute to rough riding and noisy conditions of a passenger car that cannot be discovered by the terminal car inspector. Such defects as steam pipe rattles inside the cars, berth squeaks or excessive bouncing of the car indicating a wheel that had worn eccentric should be reported to the terminal maintenance forces so that such conditions can be corrected before the car is again despatched.

In order to provide this information in some uniform manner one railroad has furnished each train conductor with a supply of printed forms of the following description:

REPORT OF PASSENGER CAR DEFECTS

TRAIN_____ CAR NUMBER_____ DATE_____

Does car ride smooth?_____

Did air conditioning equipment work OK?_____

Was electric lighting equipment OK?_____

Was car clean and sanitary?_____

Were car windows clean when despatched?_____

Did you notice any pipe rattles?_____

Was there plenty of drinking and wash water?_____

How did car ride on curves?_____

REMARKS: _____

_____

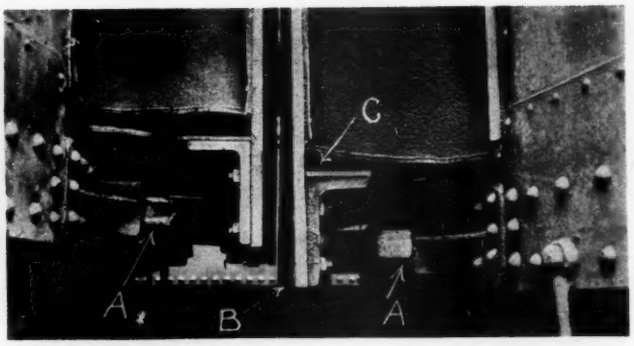
*Signed*_____

Train Conductor

This form is turned over to the station master by the train conductor upon the arrival of the train at the terminal. If there are any defective conditions reported the form is noted to the car foreman who must see that the necessary work is performed and he must personally initial the form before returning it to the station master for filing in his office.

There are many defects that do not impair the strength or safety of a car but which are responsible for noisy and rough riding conditions. Car inspectors should report these conditions so that they can be corrected before the car is again despatched. The principle causes of noisy and rough riding conditions and their preventatives are as follows:

A piece of air hose placed around the brake rod where close clearance prevails will deaden the sound of brake rods striking the underframe or center sills



A—Worn buffer stems should be shimmed and kept well lubricated to eliminate squealing; B—Vestibule diaphragms should be adjusted to fit tightly together to eliminate clanging noises in the vicinity of the vestibule; C—Diaphragm foot plates should be of the same height to prevent passengers stumbling

Couplers and Parts: Excessive free slack in draft gears, worn pivot pins, or elongated holes in the coupler stem will cause jerks when starting or stopping the train. Where more than ½ in. of free slack is found the coupler should be dropped and necessary repairs made.

Carrier Irons: Coupler carrier irons should be kept tight. The surface where the sliding plate engages the coupler should be kept well lubricated with a heavy grade of grease to prevent squeals on curves.

Pipe Clamps, Brackets, Etc.: Pipe clamps and brackets that are not tight will permit the pipes to rattle and resound through the entire car. New bolts should be applied where the old one are found to have the threads worn to the extent that they cannot be again tightened.

Brake Rods: Nothing is more annoying to passengers than the noise of a brake rod hitting against the sills or floor of a car. There are many places where there is very little clearance between the brake rods and the underframe of the car and unless some cushion is provided the noise cannot be prevented. A piece of rubber air hose cut lengthwise so it can be placed around the brake rod and secured with a piece of copper wire will deaden the sound of the brake rod striking the underframe. Where brake levers pass through the center sills a piece of oak wood secured to the lower rest with countersunk bolts will eliminate noise at this point.

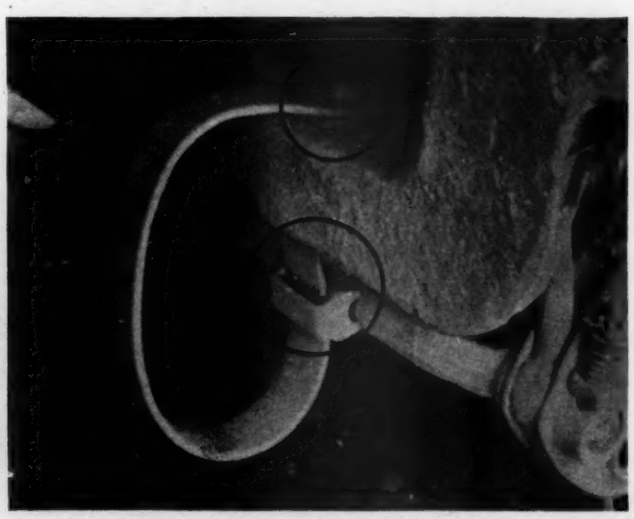
Uncoupling Levers: Coupler uncoupling levers can produce a great deal of noise by sliding back and forth in the outside casting at the step apron. While the use of a lubricant will usually eliminate squeals at this point it will not eliminate the clanging noise that is produced when the uncoupling lever is in swinging motion. To correct this condition the uncoupling lever should be wound with electricians' friction tape where it passes through the bracket.

Buffer Stems: A large part of the noise produced in the neighborhood of the vestibule or the end of cars is caused by lack of lubrication of buffer stems. Unless a good grade of heavy lubricant is applied to the buffer stems at least twice each week they will cause a squeaking sound, almost continuously. Worn buffer stems, in addition to causing squealing will rattle when the train is in motion and produce a noise that can be heard through the entire car. Unless these buffer stems are too badly worn to retain in service they can be lined up with steel shims and the rattling eliminated. Buffer stems worn in excess of ½ in. should be scrapped.

Vestibule Diaphragms: Much of the clanging noise in the vicinity of vestibules is produced by the vestibule diaphragms not fitting together properly. Springs in the buffer stems should be compressed not less than 1 in. to insure a correct pressure between the diaphragms. When cars are despatched with the vestibule diaphragms standing apart as shown in the illustration there will be a continual clanging sound produced. Diaphragm foot plates should be of the same height to prevent a passenger from stumbling when proceeding from one car to another.

Brake Beam Release Springs: Loose brake beam release springs will cause an annoying rattle under the car. These springs are usually secured to the truck frame with a single bolt These bolts frequently work loose and when they cannot be retightened due to wear on the threads, they should be renewed. The release spring clips that hold the spring to the brake beam must be maintained in a tight position to prevent rattles, and

Uncoupling levers should be wound with electrician's friction tape where they pass through the bracket at step apron to eliminate squeaks and rattles



Loose brake-beam release springs will cause annoying rattles under the car

Worn journal boxes or pedestals should be renewed or the worn surface between the box and side wall lined to prevent severe knocks when air brakes are applied

to prevent the brake beam from riding on the tread of the wheel which will produce a continuous grinding noise.

Worn Journal Boxes and Pedestals: A journal box that does not set squarely in the pedestal indicates that it is worn or that the pedestal itself is worn. This condition provides a space between the side wall of the journal box and the wearing surface of the pedestal and when air brakes are applied will cause the journal box to strike against the pedestal leg and produce a severe knock which will resound through the entire car. Where the pedestal leg is worn it should be removed and a new pedestal applied. Where the side wall of the journal box is found to be worn it can usually be repaired by inserting a steel liner on each side of the box.

Center Plates: Truck and body center plates that are loose will cause poor riding conditions on curves. This condition will permit the body of the car to slide toward the high side of the curve and produce a dull thud when the center plate strikes the bolster web. On many cars it is difficult to inspect center plates properly because of the close clearance between the two center plates. For this reason passenger cars should be raised every six months and the center plates tightened. If bolts of less than 1 in. diameter are found in center plates the center-plate-bolt holes should be reamed and larger bolts applied as smaller bolts will not remain tight at regular speeds on severe curves. Center plates should be lubricated with either dry graphite or a heavy lubricant having a graphite base at least once every six months to eliminate grinding noises that will become evident if center plates are dry. Male type center plates that are found with the male portion worn in excess of ¼ in. should be renewed. Female center plates found with the outside rim worn in excess of ¼ in. should be renewed. This condition will result in lost motion between the two center plates

Loose or worn center plates will permit the car body to slide towards the high side on curves and produce striking noises

and cause them to slip on curves and produce a loud knock.

Side Bearings: Side bearings should be adjusted so that there is not more than $\frac{1}{32}$ in. clearance between each side bearing. If there is less clearance the side bearings should be adjusted. Cars with side bearing clearance in excess of $\frac{1}{32}$ in. will sway on curves and the roller in the truck side bearings will cause a rattling noise. Side bearings should be lubricated daily with a heavy grease having a graphite base. This will eliminate squeals on curves.

Truck Chafing Plates: The term "shimmying" as applied to a passenger car is caused by one of two defects. An eccentric wheel or too much clearance between the truck chafing plates. Chafing plates should be adjusted with a clearance of $\frac{1}{16}$ in. to $\frac{1}{8}$ in. between each set of plates. A heavy lubricant with a graphite base should be applied between the chafing plates every two weeks to prevent corrosion and subsequent binding.

Wheels: Care should be exercised in selecting wheels for application to passenger cars. They should be carefully taped to determine that each wheel is of the same circumference, as a mis-mated wheel will cause a drag on the smaller wheel at speeds in excess of 50 m.p.h. Wheels should be gaged for eccentricity for the reason that a single pair of wheels that is only a fraction of an inch out of round will cause the car to bounce and shimmy at a speed of 50 m.p.h. or more.

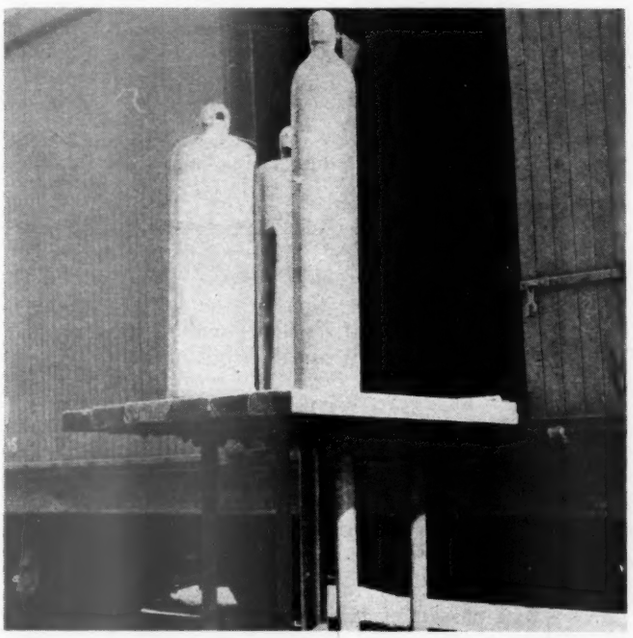
Finally, an adequate terminal maintenance force should be provided at the principle terminals where passenger cars are serviced in order to maintain the passenger equipment to the highest degree of perfection for the reason that the defects enumerated above are such that constant attention is required to eliminate complaints from passengers due to noises or rough riding of the equipment.

Truck chafing plates should be adjusted with a clearance of from 1/16 in. minimum to ⅜ in. maximum and kept well lubricated to prevent binding

Pneumatic Lift for The Car Shop

IN order to eliminate the use of ramps or runways at the car shop the pneumatic lift shown in the illustration was installed by the car foreman on one railroad. This lift was located adjacent to the oxy-acetylene plant, which was on the ground level, and can lift 10 oxygen cylinders from the ground to the level of a box car floor.

The lift consists of a 12 in. by 48 in. air cylinder which is placed in a pit below the surface. Four 3-in. staying rods are attached to the base of the platform and prevents it from turning. The platform is made from ½-in. boiler plate and is covered with 2-in. oak flooring boards. A hinged steel plate which is attached to the platform on the car side is lowered to the car floor after the platform has been raised. This eliminates any opening between the platform and the floor of the car. The lift is kept in the lowered position when not in use so that trucks can be freely operated over it. An ordinary air brake valve may be used to control the air to and from the cylinder for raising and lowering the platform.



An air lift facilitates the loading of oxygen cylinders

Shop Trucks Save Time and Labor

*By Frank B. Wildrick**

AN improvement in shop or "dummy" trucks used to replace original trucks undergoing repairs while cars are progressing through the different shopping positions at the Erie's Susquehanna passenger car shop is shown in the illustration.

The former practice was to place a cross timber on the truck, then fasten it to the center plate for the particular types of car and nail on varied blocks of wood as might be necessary to give proper side bearings. This meant keeping on hand a stock of center plates of all types as well as a quantity of timber and blocking and involved repeated lifting, nailing, adjusting and removing of blocks to obtain the required heights.

This continual re-handling has been eliminated by fastening a block permanently in the center of the truck, with a center pin hole concave and adjustable in diameter by the use of thimbles of various thicknesses. This does away with the need for carrying the many kinds of center plates. By attaching two square-topped lifts, one to each side frame, with the uprights slotted at short intervals vertically corresponding to slots cut in the side frames, so that by means of wedges inserted in the slots and through the frames, the lifts can be adjusted and held to any height required. These lifts can also be turned around so that the square-topped area is available horizontally in sufficient spread to take care of all types of side bearings.

The heavy work involved in handling timbers and metal plates is thereby reduced to the original application; after that the trucks are permanent in character and are available for instant and easy use for any kind of car that may come on the repair track.

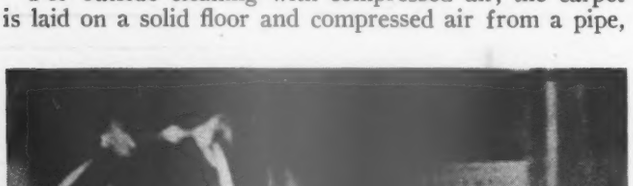
* Material supervisor, Erie Railroad, Cleveland, Ohio.

Shop or dummy trucks now being used at the Erie's Susquehanna passenger-car shops

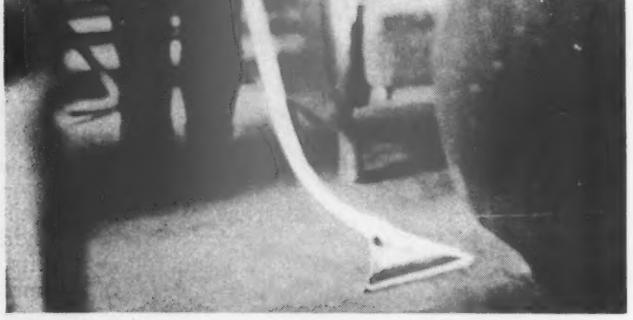
Carpet Cleaning

CARPETS in passenger cars can be cleaned without removal from the car by means of a vacuum produced through the use of a syphon jet fastened in a car window opening. Compressed air from a yard line blows through the jet creating a vacuum in a suction hose inside the car. Dirt is drawn out of the carpet by this vacuum and discharged into a muslin dust bag or strainer outside the car window. A bent handle on the vacuum tool facilitates cleaning under the seats.

For outside cleaning with compressed air, the carpet is laid on a solid floor and compressed air from a pipe, which has been connected to an air hose and thrust under carpet, is jetted between the carpet and the platform. This air jet causes the carpet to vibrate or flap violently against the floor, bringing the deeply imbedded dirt from the base of the tufts to the surface where it can be easily blown off. The method is more effective than beating and also less injurious to the carpet.



Special vacuum tool for cleaning carpets



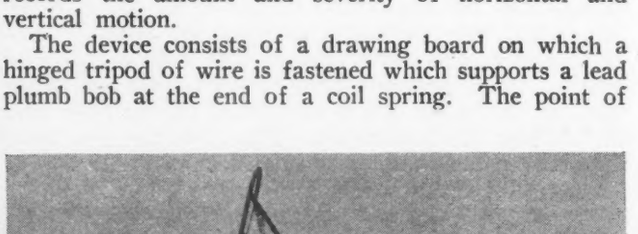
Syphon jet—Using compressed air to create a vacuum

Vibrating the carpet by a jet of compressed air underneath —Note cloud of dust rising above jet

Rough Riding Indicator

IT is often desirable to check up on the riding qualities of a passenger car without involving the expense of sending a mechanical inspector or qualified observer out on the train. This can be done by the use of a simple device placed in the locker of the car which records the amount and severity of horizontal and vertical motion.

The device consists of a drawing board on which a hinged tripod of wire is fastened which supports a lead plumb bob at the end of a coil spring. The point of



Simple indicating device used in checking the riding qualities of a car

the plumb bob rests on a sheet of onion-skin paper held down on top of a sheet of carbon paper by thumb tacks.

Horizontal motion is recorded by the stylus or point on the end of the plumb bob moving about on the paper, the carbon paper leaving a mark on the lower surface. Vertical motion is shown by the number of dots made by the point near the upper end of the plumb bob striking the paper when there is any appreciable up and down motion to the car.

To distinguish between the rough riding due to rough track and that due to defective truck adjustment, identical outfits can be placed in two or more cars on the train. An excess of side or vertical motion in any one car indicates defective truck conditions, as the track condition affects all cars alike if the trucks are in equally good condition.

At the end of the trip, one leg of the tripod is unhooked and the device folds flat for ease in carrying.

Vat for Testing Cutting Outfits

A VAT, filled with cold water and located under each oxygen and acetylene connection, has been provided by the car foreman on one railroad for the purpose of having the oxy-acetylene outfits—including the torch and hose connections—tested before the burner or welder starts to work.

Where leaks are detected the connection is tightened and again tested. If it should develop that the torch is defective, a repaired one is drawn from the tool room and the defective one turned in. This precaution will not only eliminate many accidents due to back-fire but will eliminate waste of oxygen and acetylene.

The practice of testing cutting torches and hose before use reduces accidents and saves gas

The vat can be of any size and depth desired. However, the one shown in the illustration was made from the bottom portion of an unreturnable oil drum. The lid was made locally by the sheet metal worker and should be provided to keep out dirt when the vat is not being used for testing purposes.

Reclamation of Brake Beam Struts

By A. Skinner

AFTER a brake beam has been in service for a certain length of time, the hole in the strut becomes out of round due to the wearing action of the pin which holds the live truck lever in place, and, when this occurs, the brake beam must be removed from the car and another beam with a good strut applied.

It was formerly the general practice to scrap these worn struts, after they were removed from the brake beams, as no facilities were at hand to rebore the holes so as to restore their original contour. This need was met at one large reclamation shop by means of an ingenious shop-made device, as shown in the illustrations. Referring to the first view, the jig will be seen set up on a radial drill press with a strut in place ready to be bored. The jig consists of a substantial steel base, rigidly bolted to the radial drill base plate and provided with a horizontal steel plate, or dummy live truck lever, over which the strut can be applied and accurately positioned.

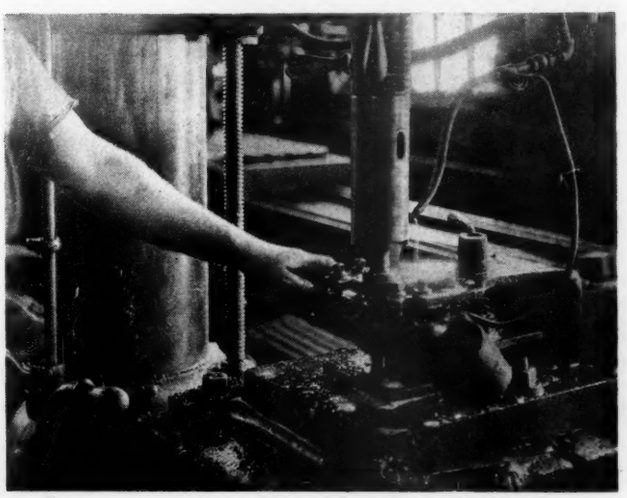


Fig. 1—Boring bar in the raised position showing cutter arrangement and upper guide bushing

The strut is rigidly held in place by means of the angle bracket and handle-nut illustrated, full bearing against the strut being secured at four points by means of the set-screws illustrated. A special boring bar and cutter arrangement, shown in detail in the raised position in the second illustration, is accurately centered and guided during the boring operation by means of the slip-bushing which fits in a suitable hold in the upper angle bracket, the lower end of the boring bar being guided by means of a bearing in the base plate. The cutter is 1½ in. in diameter, the strut being bored to that size in order to clean up the hole. After the strut is bored, a steel bushing .001 in. oversize is driven into the hole on each side of the strut, by hand- or pneumatic-hammer.

By the use of this device, an average output of 108

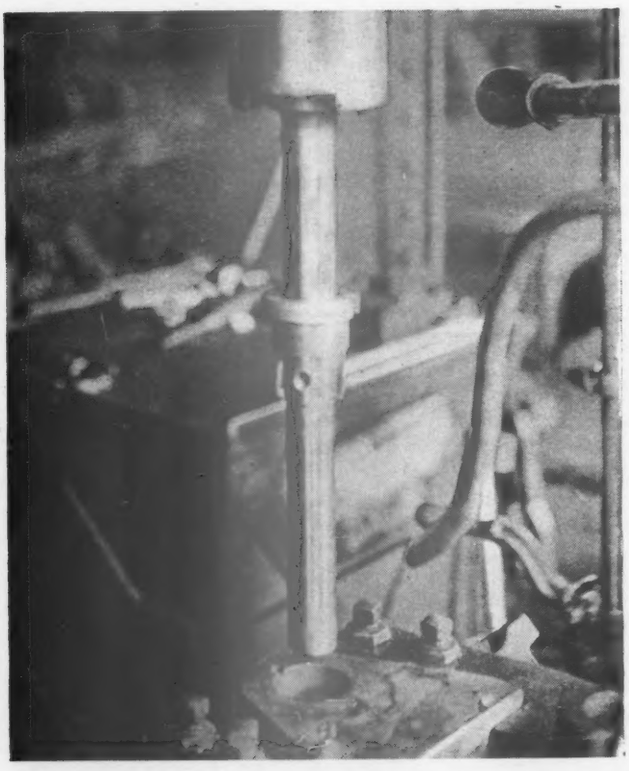


Fig. 2—Special boring jig used in reclaiming brake beam struts with worn live truck lever holes

struts per eight-hour day, or 13½ struts per hour, is obtained. The service life of struts bushed in this manner is greatly increased and a smaller number of brake beams will have to be removed from cars due to strut holes being out of round. The use of brake beam struts with accurate live-truck-lever holes, due to the application of new steel bushings, also has a tendency to keep the levers in proper alinement.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. R. A. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Repairs on Authority of Defect Cards by Other than Owner—Paint Damaged by Fire

Defect cards were issued under Chicago Interchange Bureau rules against the Chicago & Illinois Western for paint damaged by fire on sides, ends and sills of 38 L. & N. and 3 St. L.-S. F. cars. The Chicago, Indianapolis & Louisville, in whose possession the cars were when defect cards were issued, painted the burned parts and rendered bills amounting to $130.43 and $4.50 against the C. & I. W. The C. & I. W. contended that painting was not necessary for safety of trainmen or lading and as the C. I. & L. was not the owner, they were not authorized by interchange rules to make repairs and render bill therefor. The C. I. & L. contended that regardless of fact that repairs were not necessary for safety reasons, they were responsible for condition of all cars on line and were justified in billing for work performed.

The C. & I. W. in its statement contended that the charges rendered by the C. I. & L. were not authorized by the rules based on paragraph "A" and footnote to interchange Rule 1, the last sentence of paragraph "B" of this rule, and Rule 16. Paragraph A requires that each railroad give all cars on line equal care, inspection, oiling and running repairs. The footnote defines running repairs—which are the only ones permissible under this paragraph—as those ordinarily required to trucks, brakes, draft members, couplers, draft gears, and safety appliances. The last sentence of paragraph B, Rule 1, limits repairs which carriers may make to foreign cars to the minimum necessary for the safety of lading and trainmen. These rules, in their opinion, clearly indicate the intent that carriers may repair only such defects as constitute a safety hazard and, while they refer to owner's defects, the intent should be the same where the defects are of delivering line responsibility. As the defects on these cars, consisting only of paint burned, would not prevent safe operation, there was no reason why repairs could not have been deferred until cars reached home line. They, therefore, considered that the C. I. & L. exceeded their rights and that charges should have been cancelled.

The C. I. & L. stated that cars in question were in their service transporting coal from mines to Chicago and that it was their duty to give such cars equal care, inspection, oiling and running repairs. When cars were being unloaded by industries located on C. & I. W. they were damaged by fire to such an extent that it was necessary to paint same to preserve parts from further deterioration. Chicago Car Interchange Bureau defect cards were issued against C. & I. W. and we elected to make necessary repairs rather than order cars home and have them removed from revenue service. Rule 16 mentioned by the C. & I. W. as limiting repairs which carriers may make to foreign cars applies only to owner's defects. Rule does not permit repudiation of defect cards when repairs are made by carrier other than owners. The Arbitration Committee has already decided that defect cards once issued cannot be repudiated. It seems to us that as far as delivering road is concerned it does not matter who makes the repairs on authority of their defect cards, the owner or some other carrier. Furthermore, the L. & N. wrote to us: "If repairs made by you on authority of defect card conforms to original construction (two coats of paint), I do not see where we have any right, under the Interchange Rules to object to your making the repairs." As defect cards were properly issued for delivering line defects and repairs were made to conform to original construction and the L. & N. permitted them to make such repairs, they joined with C. & I. W. in presenting the case for consideration.

In a decision rendered November 8, 1934, the Arbitration Committee said: "Instead of making repairs, the Chicago & Illinois Western delegated the work through the issuance of its defect cards. While Rules 1 and 16 do not authorize repainting of foreign cars simply for the purpose of preventing deterioration, the repairing line evidently felt that it was serving the best interests of the car owner and, as no evidence is presented to indicate car owner's objection to action of the repairing line, bills as rendered on authority of the defect cards should be honored."—*Case No. 1739, Rules 1 and 16, Chicago & Illinois Western vs. Chicago, Indianapolis & Louisville.*

In the

Back Shop and Enginehouse

Repairing Pneumatic Hammers

REPAIR work on pneumatic tools for the Pennsylvania System is centralized at four regional shops located at Altoona, Pa.; Wilmington, Del.; Pitcairn, Pa., and Logansport, Ind. This article describes the manner of handling repair work on pneumatic hammers at the Pitcairn air-brake repair shop which takes care of the requirements for the Central Region.

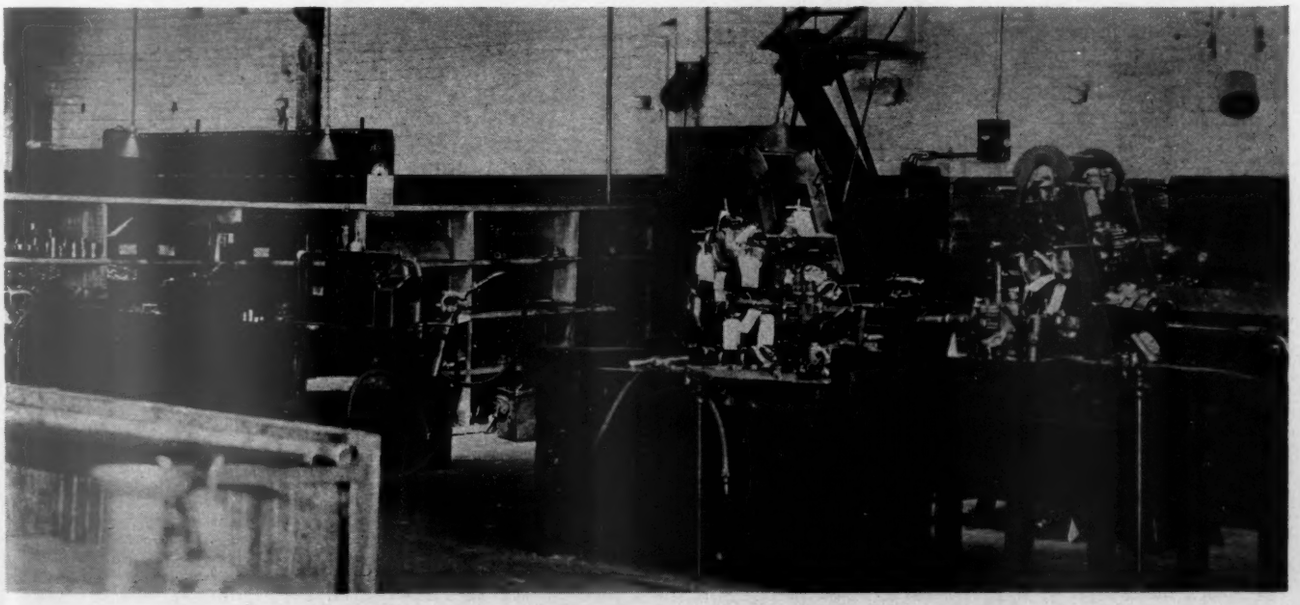
Under Pennsylvania practice no specified time is set for tools to be sent to the central shops for repairs. The shopping of such tools is dependent upon their functioning and, when they fail to function properly, they are sent in for repairs. Only minor repairs are permitted at outlying points. These consist principally of (1) cleaning and oiling the main valves; (2) renewal of pistons (on riveting hammers); (3) renewal of the trigger; (4) the regrinding or renewal of the throttle valve and spring. Repairs other than these are handled only at central repair shops such as Pitcairn.

In order to avoid confusion pneumatic tools are handled on what is known as the repair-tag system. A tag consisting of three parts is used for this purpose. On one side of each part are entered the shipping instructions and on the reverse side an identification of the tool shipped and notations as to its defects. One part of the tag is attached to the tool to be repaired; another part is turned over to the stores department; the third part is retained at the shop which ships the tool for repairs. These tags bear serial numbers and provide a valuable record in tracing lost shipments as well as an indication of the last date on which repairs were made to the tools. A record showing the serial numbers of the tools, the dates received and returned, and the nature of the repairs is kept of all tools received at the central shops. When the tools arrive at the shop they are tested (provided they are not broken or damaged) to determine their condition and the extent to which they may be operated. Upon disassembling the tools are given further careful inspection.

Repairing Pneumatic Hammers

After the initial inspection and testing has been completed the hammers are disassembled and cleaned with a turpentine substitute. One of the first operations consists of removing the valve box. On certain types of hammers, where the handle may be removed from the barrel, a steel rod of suitable size and length is inserted into the piston bore from the nozzle end until it strikes the top of the valve box. A light tap on this rod will usually remove the box complete. Provided the valve-box cap remains in the barrel, it may be removed by striking the handle end of the barrel against a block of wood or lead. On other types of hammers, in which the valve box or guide has a tapped hole, a bolt is screwed into the opening and used as a puller to remove the box or guide from the barrel. In order to disassemble

* This is the sixth of a series of articles dealing with repair work at the P. R. R. Pitcairn (Pa.) air-brake repair shop. Other recent articles appeared in the June, September and October, 1935, issues.

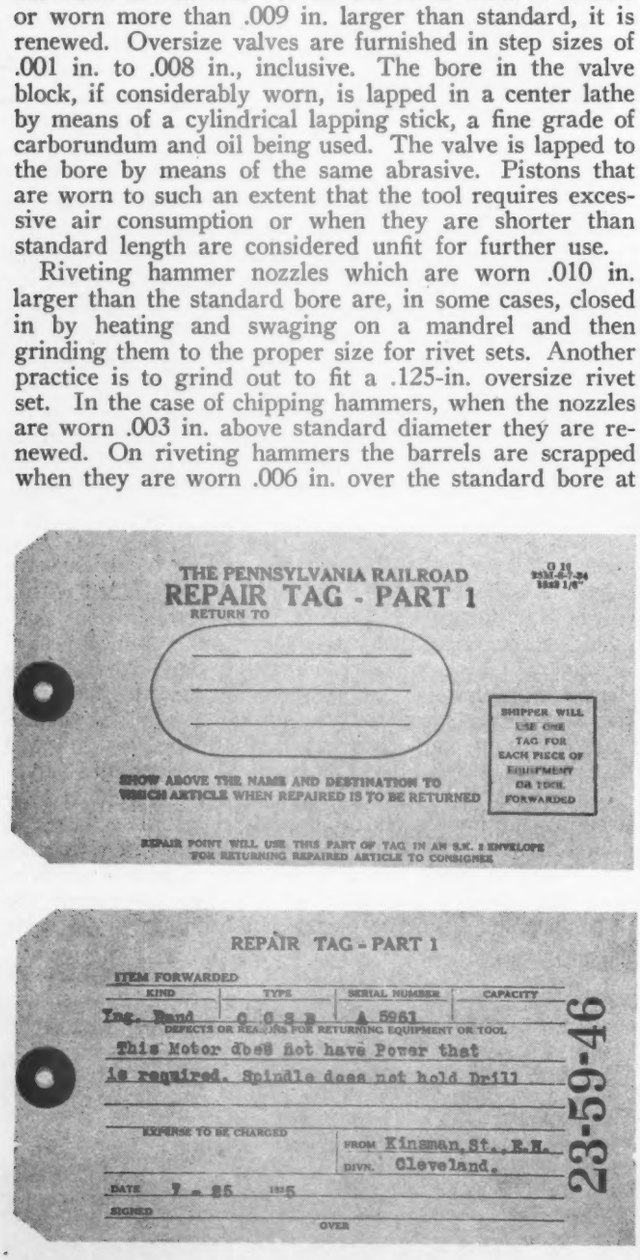


General view of the pneumatic-tool repair section at Pitcairn shop

the valve box it is held upside down with the hand gripping the center. The piston end is tapped lightly until the piston and the valve box separate. Particular care must be exercised not to grip the box or cap in a vise or try to pry them apart with a screw driver or similar tool.

When the difference between the diameter of the valve and the bore of the valve block is greater than .001 in., the valve is renewed. When the valve block is broken or worn more than .009 in. larger than standard, it is renewed. Oversize valves are furnished in step sizes of .001 in. to .008 in., inclusive. The bore in the valve block, if considerably worn, is lapped in a center lathe by means of a cylindrical lapping stick, a fine grade of carborundum and oil being used. The valve is lapped to the bore by means of the same abrasive. Pistons that are worn to such an extent that the tool requires excessive air consumption or when they are shorter than standard length are considered unfit for further use.

Riveting hammer nozzles which are worn .010 in. larger than the standard bore are, in some cases, closed in by heating and swaging on a mandrel and then grinding them to the proper size for rivet sets. Another practice is to grind out to fit a .125-in. oversize rivet set. In the case of chipping hammers, when the nozzles are worn .003 in. above standard diameter they are renewed. On riveting hammers the barrels are scrapped when they are worn .006 in. over the standard bore at


THE PENNSYLVANIA RAILROAD
REPAIR TAG - PART 1
RETURN TO
SHOW ABOVE THE NAME AND DESTINATION TO WHICH ARTICLE WHEN REPAIRED IS TO BE RETURNED
SHIPPER WILL USE ONE TAG FOR EACH PIECE OF EQUIPMENT OR TOOL FORWARDED
REPAIR POINT WILL USE THIS PART OF TAG IN AN S.K. 2 ENVELOPE FOR RETURNING REPAIRED ARTICLE TO CONSIGNEE

REPAIR TAG - PART 1
ITEM FORWARDED
KIND: Ing. Rand | TYPE: C G S B | SERIAL NUMBER: A 5961 | CAPACITY:
DEFECTS OR REASONS FOR RETURNING EQUIPMENT OR TOOL
This Motor does not have Power that is required. Spindle does not hold Drill
EXPENSE TO BE CHARGED
FROM Kinsman St., E.H.
DIVN. Cleveland.
DATE 7 - 25 1935
SIGNED
OVER
23-59-46

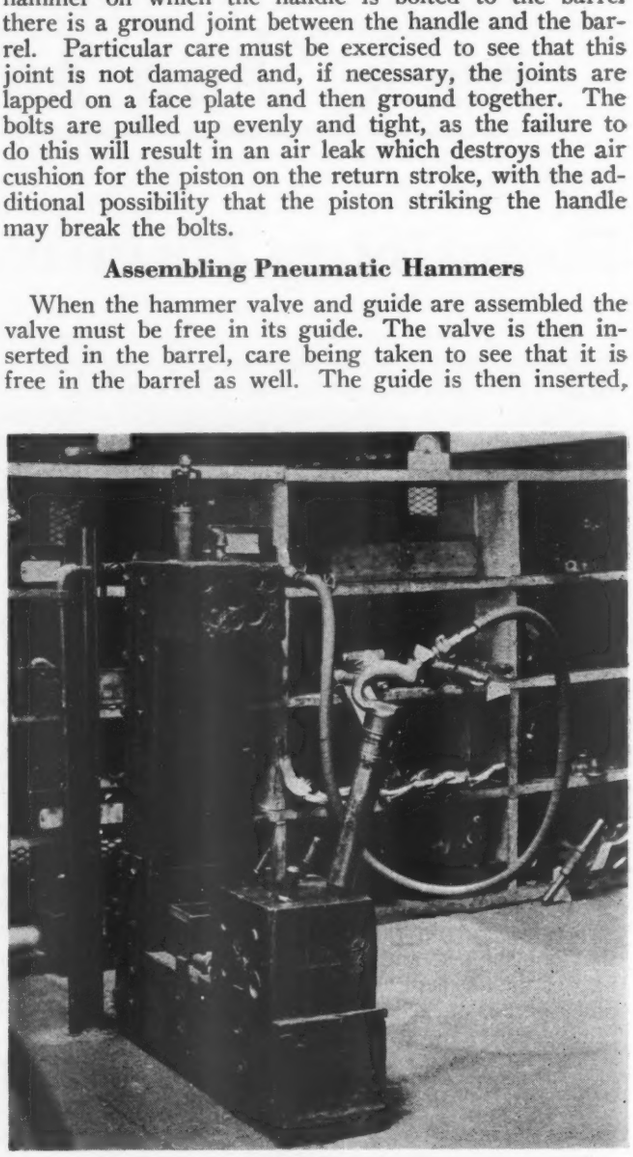
Front and reverse sides of one of the three parts of the repair tag used for shipping pneumatic tools to the central shop

the handle end. Chipping-hammer barrels are reground to the size necessary to true them up and new pistons are lapped in, although when the bore has been enlarged by grinding to such an extent that further enlargement is prohibitive, the barrel is considered unfit for further use.

The welding, by the oxy-acetylene method, of cracked barrels is practiced to a limited extent. Sometimes it becomes necessary to face the valve-block bearing in the barrel in order to aline it to the bore. This is accomplished by the use of a special reamer. On that type of hammer on which the handle is bolted to the barrel there is a ground joint between the handle and the barrel. Particular care must be exercised to see that this joint is not damaged and, if necessary, the joints are lapped on a face plate and then ground together. The bolts are pulled up evenly and tight, as the failure to do this will result in an air leak which destroys the air cushion for the piston on the return stroke, with the additional possibility that the piston striking the handle may break the bolts.

Assembling Pneumatic Hammers

When the hammer valve and guide are assembled the valve must be free in its guide. The valve is then inserted in the barrel, care being taken to see that it is free in the barrel as well. The guide is then inserted,



Device for testing the air consumption of pneumatic hammers

and, with the use of a tool known as a guide driver, the guide is driven in until it seats in the bottom. The guide driver consists of a round piece of soft steel about 4 in. long, one end of which is threaded to fit the guide and the other end is plain. As an extra precaution before applying hammer handles the practice is to shake the barrel to make sure the valve is free. On that type of hammer in which the valve box goes inside the barrel the parts are held in a horizontal position in order that the box and the cap will stay assembled when placing them in the barrel. Care is taken to make sure that the exhaust deflector is so located as to discharge the exhaust in the desired direction. Care must also be taken to insure that the lug on the deflector is in one of the notches in the barrel so as to prevent it from turning. This is done before applying the handle.

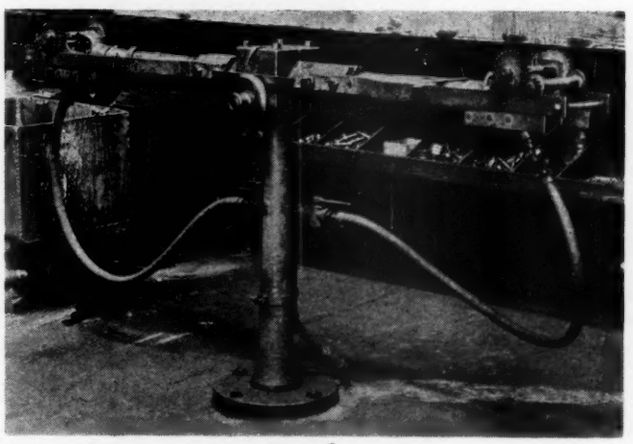
In the case of a one-piece valve box, this is assembled by placing the box on the barrel with the cupped side up and the valve on top of it. In the case of a two-piece valve box the valve seat is placed on the barrel first, then the valve, and finally the valve box with the

cupped side down. It is possible on some types to get the seat and the box upside down and, in order to prevent this, a line is cut on the edge of the seat and the box and also on the barrel so that, when assembling, these identification lines all come together.

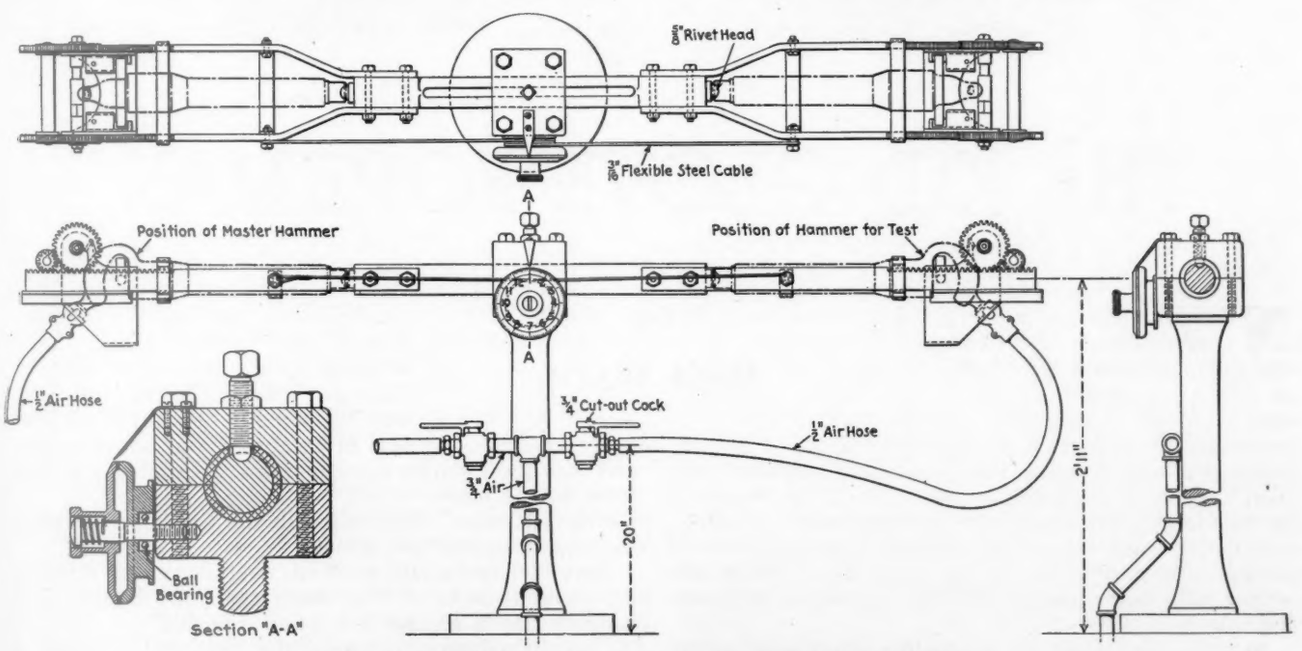
When assembling hammers equipped with the screw type handle the handle is screwed onto the barrel in such a manner that it will not disturb the valve and the box. This is accomplished by holding the barrel upright until the handle is down in the box. This prevents the valve from getting off its seat and being pinched or possibly broken. The pinch bolt is tightened in order to lock the handle.

Testing Hammers

When the repairs on pneumatic hammers have been completed they are subjected to a number of tests in order to determine the amount of air they consume, the number of blows per minute they deliver, and the power of the blow delivered. The volume of air consumed by a repaired hammer must not be more than 105 per cent of the manufacturer's rating on a new hammer of that type. The hammer is connected to a device, shown in one of the illustrations, which consists of a block against which the blows of the hammer are directed, and a meter in the air line which indicates the air consumption. Before the hammer is subjected to the tests the workman must make sure that the ports in the valve block and the handle are open. If by chance this should be restricted, the meter will show a low air consumption, which will be a false rating and not indicative of good performance. The next test is that to indicate the number of blows which the hammer delivers per minute. In making this test a hand tachometer, which is placed on the operator's shoulder, indicates the frequency of vibrations as transmitted from the hammer through the operator's arm to the tachometer. Repaired hammers must be able to deliver not less than 95 per cent of the manufacturer's rating for a new hammer of the same type. A testing machine is used to determine the power of the blow delivered by repaired hammers. This is determined by comparison with a master hammer which is known to be in first-class condition. The master hammer is placed in one side of the machine and the hammer to be tested is placed in the other side. The air is first turned on the master hammer, which, during operation, strikes the ram in the machine. The movement of the ram is retarded by a friction block in the center. As the hammer operates the ram travel is indicated in fractions of an inch on a dial on the machine. The time required to move the ram the predetermined distance is noted. This gives the performance of the master hammer, to which that of the repaired hammer is to be compared. The hammer to be tested is then subjected to the same test, the ram in this case traveling in the opposite direction without any change having been made in the fit of the ram in the friction block. The time required to move the ram an identical distance with that made during the test of the master hammer should not be more than 5 per cent greater.



Test device which compares the force of the blows of repaired hammers with a master hammer



Assembly drawing of the pneumatic-hammer testing machine

After having been subjected to these tests and passing them satisfactorily, the pneumatic hammers are boxed for shipment. Pitcairn shop, in meeting the requirements for the Central Region, repairs approximately 100 pneumatic hammers of various types each month.

Barton ripped a button off his overalls getting through the firebox door. "That beats me," the boilermaker commented, "a regular kid glove foreman!"

THE KID GLOVE FOREMAN

by

Walt Wyre

NEWS travels fast in a railroad roundhouse. The new general foreman came in on Number 10 at 3:00 p.m. Before the train got out of town, five minutes later, every man in the S. P. & W. roundhouse at Plainville knew that the man who was to take Sam Crabtree's place was in town. At 3:15 every one of them knew the foreman's name to be John L. Starkey, and that he was big as the original John L. Most of them also knew that he was wearing a derby hat, bright yellow kid gloves, and had a fallen eyebrow on his upper lip.

Starkey came right on up to the roundhouse, derby hat, kid gloves and all. He had no sooner squeezed through the door at the south end of the roundhouse than the drop-pit gang, fourteen stalls away, knew that he was on the job.

Everybody was working like a negro field-hand Saturday morning as the big foreman strolled through the roundhouse; at least every one in his sight was working. At least half of the force was watching through clear vision glasses of cab windows where they could see without being seen.

Henry Barton, the big pot-bellied boilermaker that does most of the electric welding, was in the fire-box of the 5092 welding up a crack when Starkey came in. Barton's helper, Bill Cox, was "grinding in" the fireman's seat box in the cab of the same engine and saw the foreman coming down the walkway at the front of the house.

"Hey, Barton," Cox yelled in the fire-box. "Here's the new foreman; take a look."

Barton ripped a button off his overalls getting through the firebox door. "That beats me," the boilermaker commented, "a regular kid glove foreman!"

Cox, in a hurry to spread the nickname, violated a safety rule by sliding down the grab irons from the cab. He dodged behind the engine in the next stall, out a back door, and came back in four stalls ahead of Starkey. The helper saw an engine with the cab windows closed a pretty good sign that some one was inside and didn't want to be seen. Cox wasn't disappointed; two machinists and their helpers and a coppersmith were in the cab.

"Seen the kid glove foreman?" Cox inquired casually.

The sobriquet stuck. "Kid glove foreman" he'll be

as long as he stays in Plainville.

Starkey went through the roundhouse and out to the office. A few moments later John Harris, the clerk, tacked a notice on the bulletin board: "There will be a meeting in the machine shop at 8:00 a.m. tomorrow morning. Everyone on duty at that time will arrange to be present. John L. Starkey, Gen. Foreman."

Jim Evans, roundhouse foreman, introduced Starkey to the overalled group of men. The introduction was brief: "Fellows, you all know Mr. Crabtree was transferred at his own request. This is Mr. Starkey who takes his place as general foreman."

It was evident that whatever Starkey's qualifications as a foreman might be, his ability as an orator was practically zero.

"Well, gentlemen—" the big fellow cleared his throat. His face was red as a new painted switch target, beads of perspiration dotted his wrinkled brow. "I didn't want to come out here"—that didn't sound so good—"that is, the management sent me out here to take Mr. Crabtree's place." He sighed deeply. "They made it plain that this is a tough place," Starkey swallowed his Adam's apple and continued. "Well, I can be tough, too. We got to cut down on engine failures. Everybody's got to cut in and do their part." He stood for a moment like a schoolboy trying to say a half learned recitation, and gave up. "That's all."

Evans broke the painful silence that followed by saying, "I'm sure we'll all do our best to help, Mr. Starkey," and started towards the board. The men followed.

THINGS went along pretty well the first day. The new foreman spent most of the time in the office. Next day Starkey set out to superheat the roundhouse force. He started in on the machine shop.

Machinist Jenkins was taking a cut on a valve bushing casting. He was taking a very light cut, skimming the metal.

"That a finishing cut?" Starkey asked.

"No, but—"

"No wonder the work's all behind! Here, let me show you." The general foreman stepped up to the lathe.

"But, Mr. Starkey—"

"Aw, it'll cut it, all right. Just get the tool under the surface—like this." Starkey rammed the tool an eighth of an inch in the metal. Cuttings began to fly. Henderson held a brush, used for the purpose, against the tool post to stop the flying metal.

"How long have you been doing lathe work?" Starkey asked when the cut across the casting was finished.

"Oh, about eight or nine years," Jenkins replied. "Why?"

"Well, looks like you'd a-learned something about it in that time." With that sarcastic reply the general foreman left the machine shop and went out in the roundhouse.

He stopped at the drop-pit to watch a machinist and helper, Johnson and Gibson, tramming a set of wheels on the 5075 preparatory to putting the rods on. Evidently Starkey didn't like the manner in which the work was being done, for he went over and took one end of the tram from the machinist. Johnson stood silently by, looking like a kid that furnished the bat for the ball game and then didn't get to play. Some of the surly expression left Johnson's face after he and the helper exchanged knowing glances when the boss wasn't looking. Johnson and Gibson had been working together a long time and understood each other pretty well.

After the job of tramming the wheels was finished, the foreman went down through the house. At every place he found men working, he stopped to watch. Almost invariably he found some reason to criticize the manner in which a job was being done, or to suggest a different way. His suggestions were usually good, showing that he at least knew a locomotive if he hadn't learned men. As he went through the house, he left a feeling of resentment in his wake.

He kept it up all morning, walking steadily from one job to the other. Henry Barton suggested that somebody ought to tie him up to keep him from walking himself to death.

SHORTLY after the one o'clock whistle blew, Master Mechanic Carter came to the roundhouse to see how the new general foreman was making out. Carter happened to fall in behind Starkey and probably wouldn't have caught him except for the fact that he met the foreman coming back. As he walked through the house the master mechanic couldn't help but notice the unusual activity of the place. Everybody was working like ants before a storm.

"Well, looks like you've got things humming," Carter said. "I haven't seen men working so lively since the coach shop burned down."

Starkey pushed his derby back from his forehead with a yellow gloved hand. "Yes," he replied somewhat grimly, "you know what the superintendent of motive power said. He said if I didn't make this job go I would. I'm going to do it, too, if I have to run off half the men here."

"I wouldn't try it all in one day, if I was you," the master mechanic counseled.

A laborer sweeping nearby heard the latter part of what the general foreman said. He immediately rushed out to the official broadcasting station, the shopmen's toilet, to put the latest news on the air. "The kid glove foreman is going to run half of us off the job," the laborer announced to the half dozen men in the place. With that as a starter, he elaborated on the conversation between the general foreman and master mechanic.

In the meantime, Jim Evans, having decided that two roundhouse foremen were not needed at the same time, spent the greater part of the morning in the office. Everything that was called was just about ready to go anyway, and if an extra west was needed, as expected, the 5092 would be ready to go most any time. About all that was needed to finish was the right front valve bushing and Jenkins had started on it first thing that morning.

About two o'clock the dispatcher called up for an engine for the expected extra; called for three-thirty.

"Tell him it'll be the 5092," Evans informed the clerk. "Guess I'd better go see if they got a fire in her."

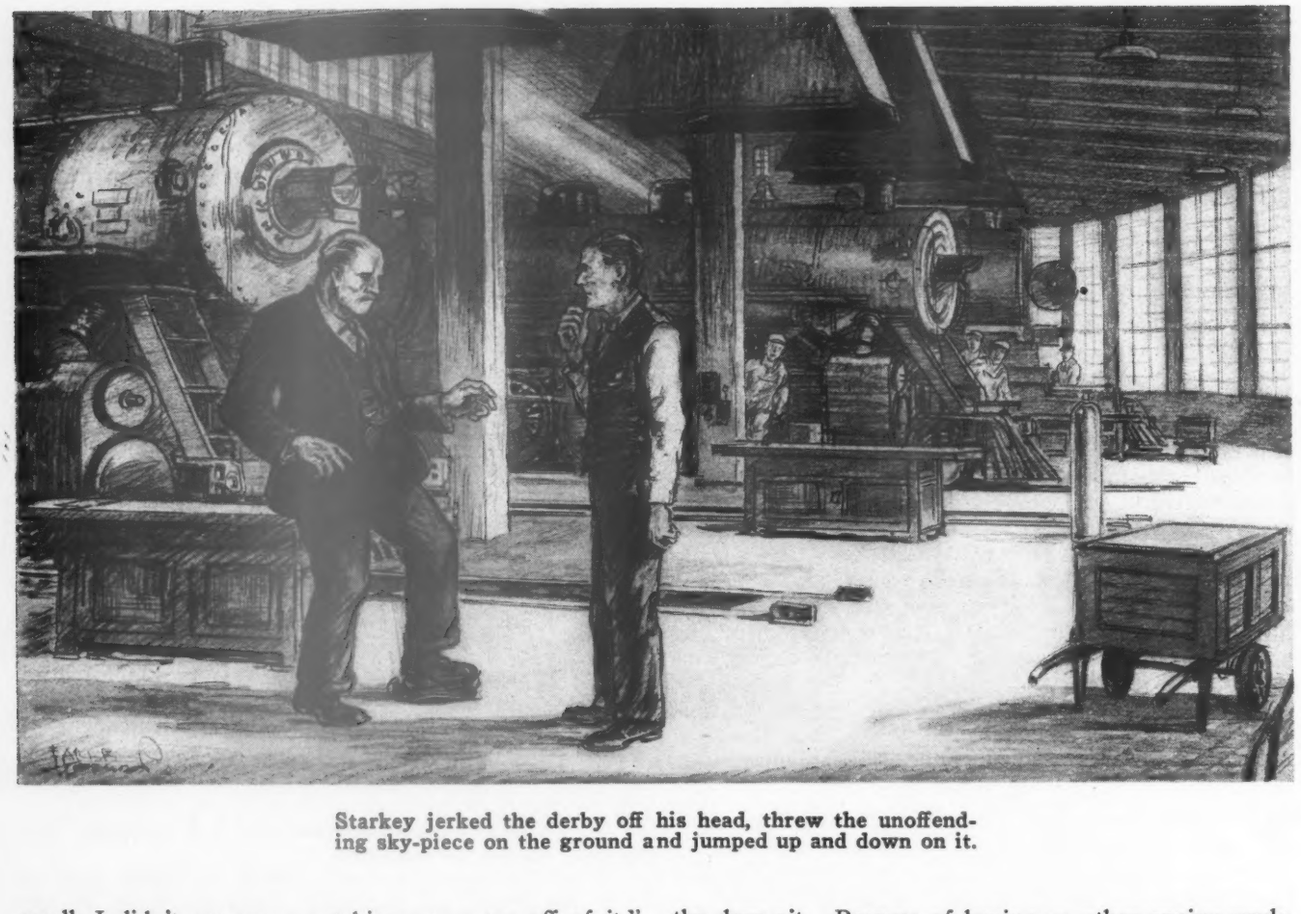
Evans sauntered leisurely out to the roundhouse and to stall twelve. The right valve piston for the 5092 was laying on a bench nearby. The right front bushing, with a jagged lengthwise gash burned in it with a carbon arc, lay on the ground. There was no bushing in the front end of the valve cylinder.

Evans, as he looked things over, absent-mindedly fished in his pocket for his plug of "horseshoe." He bit off a nickel's worth and headed for the machine shop like he was racing with his shadow.

The bushing was laying on the machine shop floor. No finishing cut had been taken on the casting. Jenkins was making a middle connection bushing.

"Why didn't you finish this valve bushing before you started on anything else?" Evans asked loud enough to be heard above the noise of the lathe.

"Well, being as it is already over a sixteenth too



Starkey jerked the derby off his head, threw the unoffending sky-piece on the ground and jumped up and down on it.

small, I didn't see any use taking any more off of it," Jenkins replied.

"Why in thunder didn't you tell me you'd killed it? How come you made a bull like that anyway?"

"Didn't; the kid g——, I mean the new general foreman was showing me how to run a lathe," Jenkins told him.

"Why didn't you get another casting?" Evans wanted to know.

"There wasn't any in the storeroom."

Evans swore almost pathetically. There wasn't another engine that could be gotten ready for the special. He found Barton and set him to work building up the casting with electric weld and went back to the office to break the news to the dispatcher that the engine on the extra would have to be run through, meaning an hour or more delay.

THREE days after Starkey came on the job as general foreman, an air of nervous tension pervaded the roundhouse. The men no longer joked and jibed at each other as they went about their work. Every one seemed to be working at top speed, but somehow the work was never done on time. Delays and failures began to pile up; engines wouldn't steam; injectors failed because of stopped up tank hose, that happened twice in as many days; hot pins, hot driving-boxes. Starkey got to the point that in addition to trying to be general foreman and roundhouse foreman he tried to inspect every engine that came in or went out. Not satisfied with all that, he occasionally jumped in and gave a hand on a rush job. The yellow kid gloves became black with grime. He threw them away in favor of a pair of leather palmed canvas ones such as the mechanics wore.

The last straw was added when the 5075 came off the drop-pit. Because of having no other engine ready, Evans took a call on her for an east-bound drag before he had a chance to limber the engine up. They had to cut the engine out at the first station twenty miles away, half the bearings on her burnt up.

Starkey was out in the roundhouse when the clerk told him about it. That was when the derby went. Starkey jerked it off his head, threw the unoffending sky-piece on the ground and jumped up and down on it. He went bareheaded the rest of the day. Next morning he wore an old soft hat to work.

The master mechanic was on hand when the 5075 was brought in. He was chewing fiercely on an unlighted cigar. "Who put this engine up?" he demanded.

"Why, Jenkins put the wheels up and the rods on, I believe," Evans replied.

"Send; get him!"

Evans soon returned with Jenkins.

"Jenkins," Carter glared, "Jenkins, I thought you were too good a mechanic to put up a job and have it fail like this."

"I thought it was O.K." the machinist replied.

"Thought it was O.K.—you're supposed to know it was O.K. Did you check the lateral on all the bushings?"

"Yes, sir."

"Are you sure they were all well greased?"

"Yes, sir."

"Well, it looks damned funny to me. Go get a tram rod. I want to see if the wheels are in tram."

"I'm certain the wheels are in tram," Starkey cut in. "I know because I checked them myself."

"Well, I'm going to check them myself. Somebody has got to explain why an engine coming right off the drop-pit burns up every rod bushing on it," the master mechanic told him.

The wheels were not in tram; in fact, they were badly out. No one but Carter and the general foreman knew what transpired in the office, but according to those claiming to know the walls of the building were seen to bulge and recede while the conversation was going on.

From that time Starkey spent more time in the office and less in the roundhouse. In fact, to keep up with the volume of correspondence that piled in, he didn't have much time for anything else.

STRANGELY enough, things began to improve in the roundhouse. Men worked with less feverish rush but seemed to accomplish more. There was, however, still a great deal of room for improvement. The strain had begun to tell on the general foreman also. His face showed tired lines, his eyes an abstracted look as though peering in the distance and seeing nothing. When the men went to him to ask him anything, which was very seldom, his replies, more often than not, were disconnected and without clear meaning. The kid glove foreman was letting the job get him down and he knew it.

About a week after the dismal failure of the 5075, he received a personal letter from the superintendent of motive power. The letter stated in effect that the superintendent of motive power had been seriously disappointed in results and unless a marked improvement could be shown immediately he had no choice but find another general foreman for the Plainville roundhouse.

While Starkey was reading the letter, the phone rang. The clerk answered it. "Hello—yes—wait just a second. O.K., go ahead slow so I can copy it."

Starkey went over to the desk and read the message as the clerk copied it in long hand. The message was addressed to J. L. S., and was: "Engine 5081, train No. 10, failed Sanford date. Broken crosshead guide yoke, badly cracked, old crack. Train delayed three hours forty minutes. Take inspector responsible out of service. Will hold formal investigation on arrival Plainville. Answer quick. H. H. C."

The initials were those of H. H. Carter, master mechanic. As Starkey read the message, his face reddened. A line of white showed on each side of his mouth.

"What'll I tell him?" the clerk asked.

"Tell him—" Starkey swallowed hard, "tell him that I'm responsible for the failure. I O.K.'d the engine and knew the guide yoke was cracked; run it anyway, didn't have another engine. The inspector showed me the crack," Starkey added.

News travels fast in a railroad roundhouse. In less than two hours every man in it knew that the general foreman had deliberately lied to save the inspector's job. Not only did they know he had deliberately lied, they knew that he had done it when his own job was hanging by a thread. Why he had done it, Starkey couldn't have told himself. All he knew was that he was tired of rawhiding men—tired of the job he had tried to make a go of and failed. He wanted to go back to the erecting floor job in the backshop where everything was routine work, no hot shot, no engine failures, just eight to five, the same old thing. He slumped wearily in a chair.

Two days later the master mechanic returned to Plainville. Fifteen minutes after he got to town, every one in the roundhouse knew it. Almost immediately an air of suppressed mystery, an intangible something about to happen, suffused the shop. Men congregated in little groups of two's and three's. Several were seen talking to the roundhouse foreman. A little later five men of different crafts in the roundhouse, machinist, boilermaker, blacksmith, coppersmith, and electrician were on their way to the master mechanic's office. The five men stayed in the office nearly an hour.

After they had left Carter called the general foreman and told him to come to the office.

"Starkey," the master mechanic began, "your showing as a general foreman has been miserable. Engine failures and delays have been terrible. Some of them absolutely inexcusable. I had intended to wire the superintendent of motive power today to ask that you be transferred immediately."

"Yes, I know. I—"

"No, I don't believe you do know, but I'm giving you another chance to learn, and I'm going to tell you something else. Five men representing the men in the roundhouse called on me a few minutes ago and asked that you stay here. Each one of those five men was willing to take the blame for the poor showing you've made. Why, I don't know, but I can tell you this much, when you can get a bunch of men feeling that way, you're a long ways towards correcting the trouble that is in the shop."

"Thanks, Mr. Carter—"

"Hell, don't thank me, thank the men. I tried to tell you the first day," Carter interrupted.

There was a notice on the bulletin board that afternoon: "There will be a meeting of roundhouse employees in the machine shop at 8:00 a.m. tomorrow morning. All employees that can arrange to do so will please be present."

"Fellows—" Starkey began, swallowed a lump and started over. "Fellows, I—I think," he stalled again. "Damn it, thank you!" A tear rolled down each cheek. "That's all," he finished gruffly.

Silence, then some one clapped, and everybody clapped. Not much had been said, but—they understood. He would still be the kid glove foreman, but the nickname had taken on a different meaning.

Ram-Type Production Turret Lathes

THE Gisholt Machine Company, Madison, Wis., is introducing an improved design of ram-type turret lathe in three sizes which are efficient both in high-production work and in small lots. These machines are easy to operate, their fast manipulation being due partly to automatic labor-saving devices built into the machines.

The hexagon turret and its stop roll are indexed automatically to the next position with the back movement of the ram slide. As the ram slide goes forward to the work the hexagon turret is located automatically and clamped in place. As the operator need not take his hands from the pilot wheel to accomplish this whole operation, it is simple to carry through the cycle of operations and without lost time.

The quick-indexing square turret on the cross-slide is arranged for holding four tools. Here again a single lever movement accomplishes the indexing, locating and clamping. A forward and backward movement of the lever is all that is required to index the tool post preparatory for the next operation.

The selective gear transmission permits a change in spindle speed without passing through intermediate speeds. Three levers, simply operated and conveniently located, control the 12 speeds available. One lever splits the 12 speeds into two groups of six speeds each, one high and one low. The second lever splits the group being

used into two further groups of three speeds each. The third lever selects from this group the particular speed desired. The shift from high to low speed, as from drilling to reaming or from turning to threading, is made through multiple-disc clutches and is done without stopping the spindle. The shifting mechanism is simple and has no complicated mechanism.

A single lever controls shifting from forward to reverse. When the lever is in the neutral position a brake is applied automatically to stop the spindle. No time is lost waiting for the work to coast to a stop before being reversed. A safety latch in the neutral position prevents accidental starting.

The headstock is oiled automatically by a splash system, the gears running in a bath of oil which is carried to all bearings and moving parts at all speeds. The tapered-roller spindle bearings are continually oiled with clean filtered oil from a catch reservoir. The aprons are oiled automatically by a forced-feed system which pumps a steady stream of oil over the gears and bearings. Hand

Gisholt ram-type high production turret lathe

pumps are provided at the apron ends for lubricating the way, a few strokes of the pump lever being all that is required when starting the machine.

The three new Gisholt ram-type turret lathes are identical in design and construction, differing only in size and capacity. They cover 1½-in. to 2½-in. bar capacity and 8-in. to 15-in. chucking capacity. All machines are equipped throughout with tapered roller anti-friction bearings and hardened alloy-steel gears. The ways of the turret slide, saddle and bed are hardened steel, securely attached and ground in place.

The Universal Turret Lathe

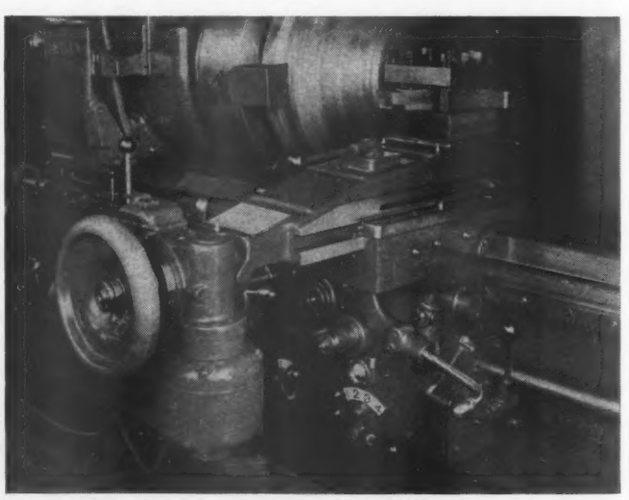
A NEW 4-A universal turret lathe is announced by the Warner & Swasey Company, Cleveland, Ohio. The machine is offered in 8-in. and 9-in. spindle capacities and 28¼-in. swing. The spindle is mounted on Timken bearings at the spindle nose end and on straight-roller bearings at the rear. All shafts of the head are mounted one above the other to the rear of the spindle, thus placing the rear train entirely to the rear. This construction promotes rigidity and permits a larger spindle.

The bed section reaches down almost to the chip pan, passage for chips being provided in arched holes under the rear way of the bed. A new cross slide and square turret offer rigidity featured by a square lock gib, used for the first time in combination with the conventional dovetail on the opposite side of the cross slide. This construction offers increased capacity for absorbing the strains in overhanging tools; it supports the heaviest cuts taken by carbide cutters without vibration. Hard steel replaceable wear strips have been added to the seat of the cross slide to further preserve initial accuracy.

The square turret has an internal-circumference clamp ring which eliminates the tendency at this point for looseness due to excessive wear. The indexing clamp handle is located in front where it overcomes interference with hexagon-turret tools when indexing, which construction permits indexing in tight positions. As optional equipment, an open-type square turret can be furnished which permits multiple tooling and the holding of long-shank forming tools. Conventional rockers are replaced by shims to elevate the cutting tool to the correct height, a construction essential on carbide tools to insure correct cutting angle after cutter regrinds.

Both hexagon-turret slide and square-turret carriage are equipped with an oil reservoir and a Bijur pump. The pump is actuated by the travel of the slide and automatically lubricates the ways whenever the slide moves. The oil reservoir being a glass chamber and separate from the apron mechanism is sealed against coolant. The ways are protected by patented covers.

A direct-reading indicator is found in the head-gear shift which affords increased ease of operation and enables the operator readily to pick the desired spindle speed without referring to diagrams or charts. Rapid traverse is offered as optional equipment for the cross slide. For certain chucking operations where frequent in-and-out movement is necessary, this is a definite time saver. This is provided through an electric unit



Increased life and convenience of operation are embodied in new Warner & Swasey universal turret lathe

mounted in front of the handwheel and equipped with a built-in switch. Large contacts permit quick and effortless control of the cross slide in either direction. The cross-slide handwheel is of heat-treated aluminum alloy to reduce momentum.

An independent lead screw is an important feature for threading operations. A solid lead screw is provided which is independent of the feed shaft. This screw is used for threading purposes only while all feed and rapid

traverse functions operate through the usual rack and pinion. By this means the accuracy of the lead screw is preserved throughout the life of the machines. Pick-off gears are provided which are changed to provide the desired pitch of thread. A feature of this unit is the quick return of the carriage at a constant speed of 5 ft. per min., independent of spindle speed and accomplished through a convenient lever on the apron without reversing or stopping the spindle.

Light Compact Tire Gage Gives Accurate Readings

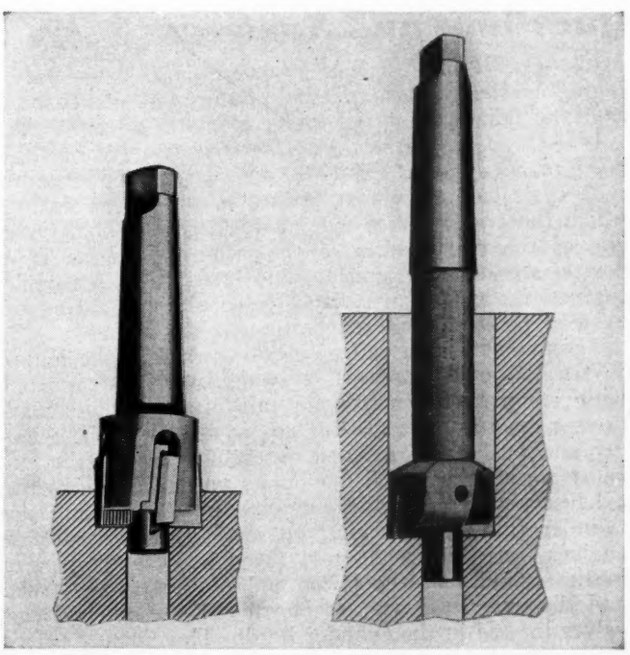
A SHOP-MADE micrometer tire gage, developed and used successfully for some time at the Moberly, Mo., shops of the Wabash, is shown in the drawing. The gage is compact and light, weighing only 15 lb. It has long ranges due to the telescoping feature, is conveniently handled and gives unusually accurate readings. It can be used to caliper any tire or other part from 44 in. to 86 in., and give the exact size to $\frac{1}{128}$ in.

The gage is made to read in sixty-fourths instead of thousandths, as the average railroad mechanic works to these dimensions instead of thousandths. This gage will give the exact size of any object calipered without recourse to rule or tape line, which is necessary on ordinary tire calipers. For example, if necessary to order a tire for a locomotive to match other tires, the opposite tire is calipered and a reading of the gage shows the size to order, while with ordinary tire calipers it is necessary to measure between points, and if the long scale used is defective, which is often the case, the tire, when received, will be either too small or too large.

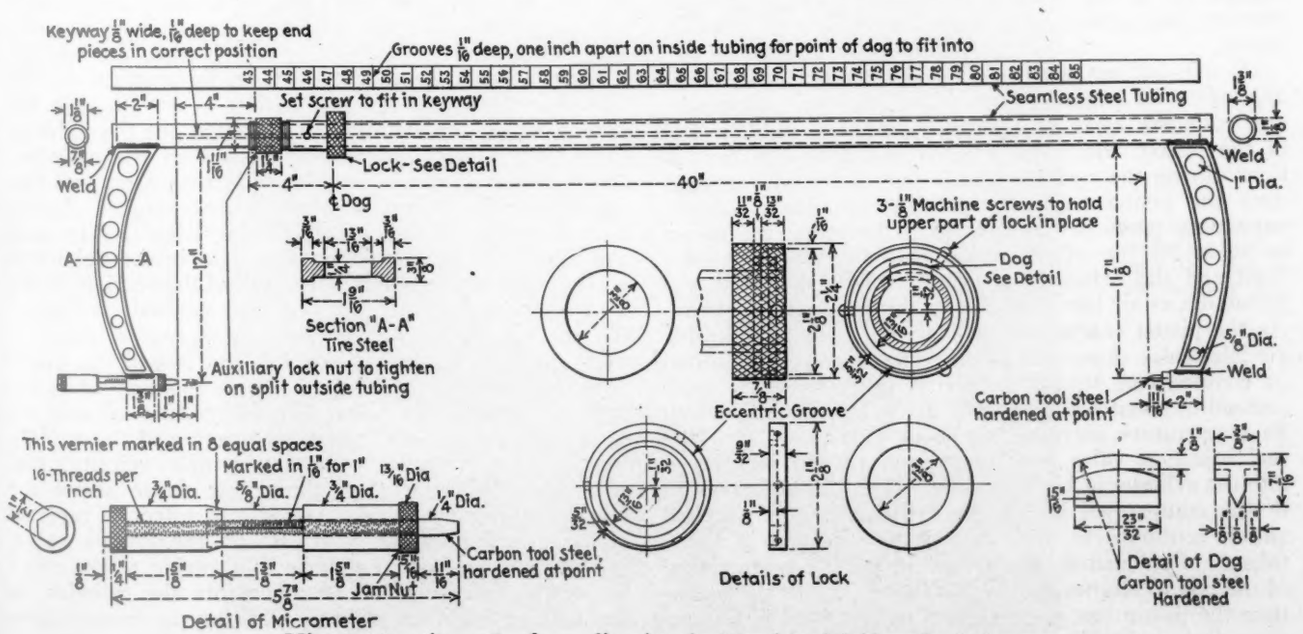
This gage is also a great help in turning tires accurately. The reading of the vernier shows the exact amount necessary to take off each tire to make all of the same size. The detailed construction of the gage is quite clearly shown in the drawing.

Zee Lock Counterbores

THE Ingersoll Milling Machine Company, Rockford, Ill., has extended the application of inserted Zee-lock cutter blades to counterbores. Two designs are offered—one of the shallow type used for shallow boring or spot-facing operations, and another for deep boring operations. Both incorporate the Ingersoll Zee-lock cutter blade which is positively locked and adjustable in two directions. Furthermore, the serrations are broached into the cutter housing so that by moving the cutter blade to the next slot in sequence it



Counterborer with Ingersoll zee-lock cutter blades



Micrometer tire gage for calipering locomotive driving wheel tires

is moved out only part of a serration. The diameter is thus maintained with a minimum of grinding.

The shallow counterbore which has four serrated blades interlocked with a hardened and ground pilot is used for counterboring where the depth of the hole is less than one half the diameter. The deep counterbore has two husky adjustable serrated blades and a body well relieved for generous chip allowance, so that holes of great depth may be counterbored, or previously drilled holes enlarged.

Diesel Engine Questions and Answers

13.—*Q.—What is meant by scavenging?* A.—Scavenging is the removal of the products of combustion from the cylinder of an oil engine after the power stroke.

14.—*Q.—What is meant by the term two-cycle as applied to oil engines?* A.—In the two-cycle oil engine each cycle comprises two strokes of the piston during which the crank makes one complete revolution. Only one of the two strokes of the two-cycle engine is a power stroke. In marine and stationary two-cycle engines, instead of an exhaust valve, there is a ring of exhaust ports around the bottom of the cylinder. As the piston nears the end of its downward stroke it uncovers the exhaust ports, scavenging valves supplied with low-pressure scavenging air from an air compressor open and the scavenging air flows into the cylinder and pushes the exhaust gases out through the exhaust ports. As the piston on its up-stroke covers the exhaust ports, the scavenging valves close leaving the cylinder full of fresh air. In some railway two-cycle engines fresh air is admitted through scavenging ports in the cylinder at the lower end of the piston stroke and the exhaust gases are blown out through exhaust valves located in the cylinder head. The exhaust valves are actuated by a cam shaft and open approximately 30 deg. of crank rotation before the scavenging ports are uncovered. The exhaust valves remain open while these ports are uncovered. On its upward or compression stroke the piston compresses the air in the cylinder and as it nears the top of its stroke fuel is injected which is ignited by the high temperature of the compressed air in the cylinder, the gases burning and expanding and pushing the piston down on its working stroke.

15.—*Q.—What is meant by the term four-cycle as applied to oil engines?* A.—In a four-cycle oil engine one complete cycle of operation requires four strokes of the piston, the crank making two complete revolutions during the cycle. In only one of the four strokes does the piston receive a turning impulse from the expanding gases in the cylinder. Assuming the piston to be at the top of its stroke with the air inlet valve open and the exhaust valve and fuel valve closed, the piston draws air into the cylinder during its down stroke. As the piston reaches the end of the suction stroke the air-inlet valve closes and as the piston rises on the second or compression stroke the air in the cylinder is compressed to about 450 lb. per sq. in., as the result of which its temperature increases to about 1,000 deg. F. The fuel injection valve now opens and the oil is sprayed into the cylinder at high pressure. The high-temperature of the compressed air in the cylinder ignites the fuel and it continues to burn as long as injection is maintained. Combustion of the fuel raises the temperature of the gas to approximately 3,000 deg. F. In the meantime the piston has started down on the third or expansion stroke with the gas expanding behind it. The injection valve closes shortly after the piston has started down on this stroke. At the end of this stroke the exhaust valve opens and the burned gases in the cylinder, now reduced to about 40 lb. per sq. in. pressure and correspondingly reduced in temperature, start to flow out through the exhaust pipe. As the piston rises on the fourth or exhaust stroke it pushes the remaining gas out of the cylinder. At the end of this stroke the exhaust valve closes, the air inlet valve then opens and the cycle of operation starts over again.

16.—*Q.—Explain the cycle of operation of a four-cycle Diesel engine, both solid-injection and air-injection.* A.—The main features of the cycle are the same whether solid-injection or air-injection is used. With air-injection, compressed air at 800-900 lb. per sq. in. forces the fuel through the atomizers or spray valves into the cylinders. With solid-injection this is done by the pressure of the fuel-oil pump. In the four-stroke cycle, on the first down stroke air is drown into the cylinder from the atmosphere through the air inlet valve. On the up stroke this air is compressed by the piston to approximately 450 lb. pressure and 1,000 deg. F. Just before the end of the stroke the fuel is injected; this, mixing with the heated air, ignites and combustion is started. The third stroke is the working stroke. Combustion continues until the fuel is consumed. The fuel is cut off at about 0.1 stroke. Expansion of the gases generated by combustion drives the piston down till near the end of the stroke, when the exhaust valve opens and the burnt gases are released. During the fourth stroke the remaining exhaust gases are expelled through the exhaust valve, after which the cycle of operation is repeated.

17.—*Q.—What is the true Diesel principle?* A.—(a) Compression sufficient to produce the temperature requisite for the spontaneous combustion of the fuel. (b) Injection of the fuel by pressure or a blast of compressed air. (c) A maximum cycle pressure (attained during combustion) not greatly exceeding the compression pressure, and absence of pronounced explosive effect.

18.—*Q.—Describe the suction stroke of a Diesel engine.* A.—If the engine is considered to be at its top dead center, and just about to begin the suction stroke, the suction valve is already slightly open. At the same time the exhaust valve, which has previously closed during the exhaust stroke, has not yet come on its seat. The result of this state of affairs is that the rapidly moving exhaust gases create a partial vacuum in the combustion space and induce a flow of air through the suction valve, thus tending to scavenge out the exhaust gases, which would otherwise remain in the cylinder. As the piston descends, its velocity increases, and reaches a maximum in the neighborhood of half stroke. At the same time the suction valve is being lifted off its seat and attains its maximum opening also in the neighborhood of half stroke. The lower half of the suction stroke is accompanied by a more or less gradual closing of the suction valve, which, however, is not allowed to come on its seat, until the crank has passed the lower dead center, by about 20 deg. At the moment when the crank is passing the lower dead center, the induced air is passing through the restricted opening of the rapidly closing suction valve, with considerable velocity, and an appreciable duration of time must elapse before the upward movement of the piston can effect a reversal of the direction of the flow through the suction valve. It will be clear from the above that, owing to the effect of inertia, more air will be taken into the cylinder, in the manner described, than by allowing the suction valve to come on its seat exactly at the bottom dead center.

NEWS

THE UNITED CARBON COMPANY has ordered 10 covered hopper cars from the American Car and Foundry Company.

THE PENNSYLVANIA has ordered 10,000 sets of AB brake equipments from the Westinghouse Air Brake Company.

THE ATCHISON, TOPEKA & SANTA FE is inquiring for 500 box cars of 50 tons' capacity and 50 hopper cars of 70 tons' capacity.

THE NATIONAL OF MEXICO has placed orders for Coffin feedwater heater systems, totaling 39 equipments, with the J. S. Coffin, Jr., Company, Englewood, N. J., through its foreign representative, the International Railway Supply Company, New York.

THE PEORIA & PEKIN UNION has ordered one Diesel-electric switching locomotive from the American Locomotive Company. This locomotive will be equipped with General Electric electrical equipment and McIntosh & Seymour power plant.

THE CANADIAN PACIFIC has ordered from Fafnir Bearings Incorporated, New Britain, Conn., roller bearing journal boxes to equip eight coaches. Fafnir bearings have recently been placed on two tenders of New York Central Hudson type engines.

Union Pacific Orders Two More "Streamliners"

Two more streamline trains have been ordered by the Union Pacific from the Pullman Standard Car Manufacturing Company. They will be placed in service between Chicago and Denver, Colo., in June on a schedule of 16 hours for the 1,048 miles via the Chicago & North Western and Union Pacific, effecting a saving of a business day or nine hours as compared with the present fastest schedule, 25 hr. 15 min. eastbound. They will be the fastest trains in the world for distances of 805 miles or more, the average for the 1,048 miles being 65.5 miles an hour, including stops. Between Omaha and Denver they will be the fastest for distances greater than 360 miles.

The proposed schedule between Chicago and Denver calls for 8 hr. for the 488 miles over the Chicago & North Western from Chicago to Omaha, Neb., an average of 61 m.p.h., and 8 hr. for the 560 miles over the Union Pacific from Omaha to Denver, an average of 70 m.p.h.

The new trains, to be known as "Streamliners—City of Denver," will leave Chicago and Denver every day in late afternoon, arriving at the terminals the following morning, arrival and departure at Chicago being arranged to allow ample time for passengers to make connections with eastern trains. No extra fare is contemplated and low cost individual tray-meal service will be available in addition to regular dining-car service.

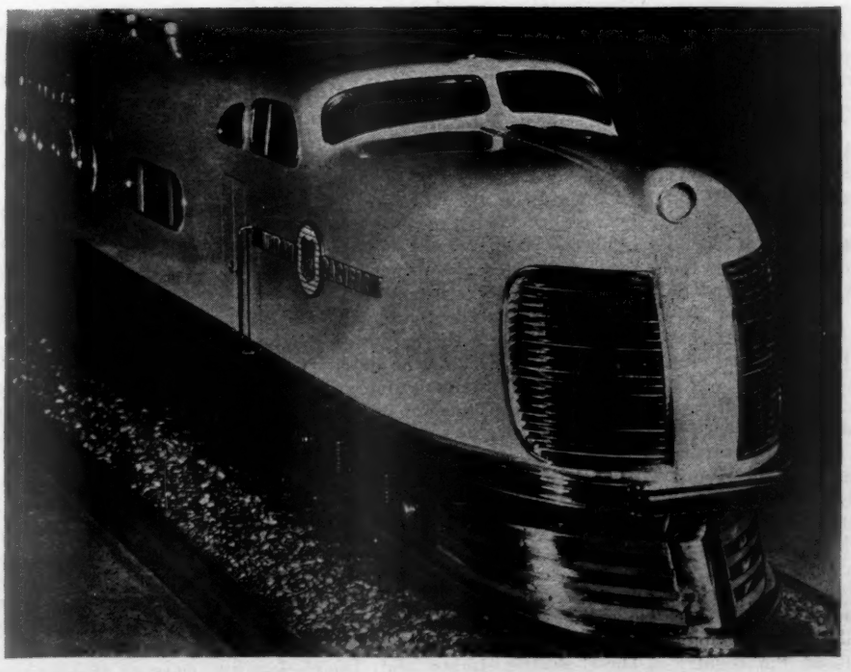
Each train will consist of a 2,400-hp. tandem power unit and 10 cars, including three Pullman sleeping cars, a Pullman room and observation car, a dining car, two coaches, equipped with adjustable, reclining seats, and three cars for baggage, mail and express. Each section of the power unit will contain an Electro-Motive Corporation 1,200-hp. Diesel engine, directly connected to generators, which will provide current for electric motors on each truck of the power cars. Each of the tandem power units will be so arranged that both engines or either individually can be operated from the controls in the cab of the first unit. The overall length of the trains will be 858 ft. and the total weight about 600 tons. Passenger capacity will be 82 in the Pullman cars and 100 in the coaches, or a total of 182. Externally the passenger-carrying cars will be of standard width, but the interior, by reason of the type of design, will be five in. wider than present standard cars and of same height.

The power cars will be built of Cor-Ten steel furnished by the United States Steel Corporation, while the principal structural material of the other cars will be aluminum alloy, except that the trucks, complete, and couplings between cars, will be steel. The aluminum alloy used will be furnished by the Aluminum Company of America.

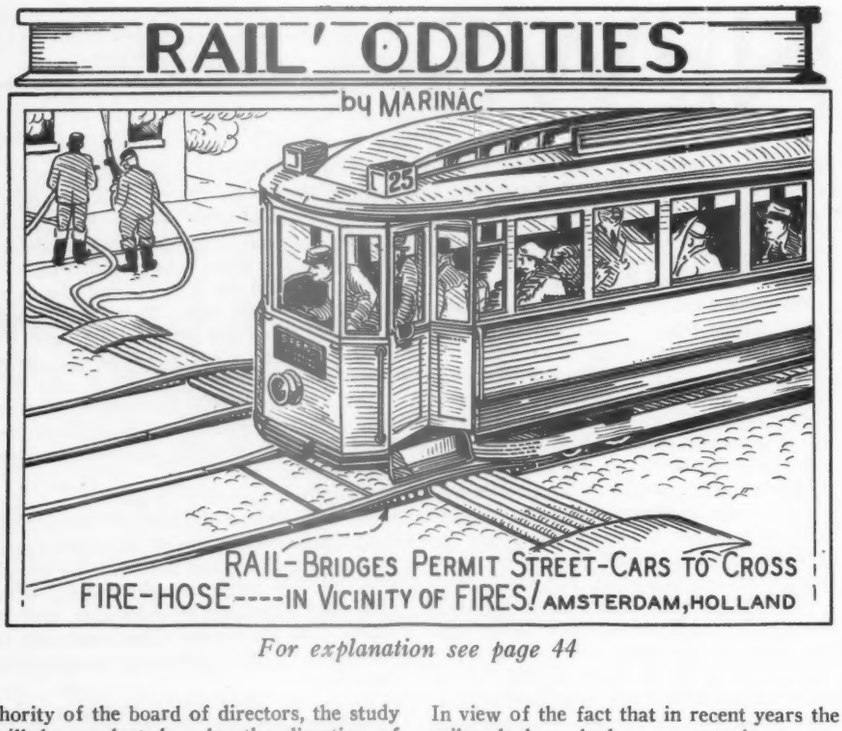
These two additional streamliners when completed will give the Union Pacific a fleet of six such trains—two for service between Chicago and Denver, one between Chicago and Portland, Ore.—two between Chicago and San Francisco, Calif., and Los Angeles, and one between Kansas City, Mo., and Salina, Kan.

Air-Conditioning Study Authorized by A. A. R. Board

A THOROUGH study of the various systems now in use by the railroads for the air-conditioning of passenger cars is to be made by the Association of American Railroads, J. J. Pelley, president of that Association, has announced. Under au-



Both or each power unit of the Union Pacific "Streamliners — City of Denver" can be controlled from the cab in the leading car.



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thority of the board of directors, the study will be conducted under the direction of L. W. Wallace, director of the Equipment Research Division.

While practically all the principal railroads of this country, as well as the Pullman Company, are making use of air-conditioning devices for passenger equipment, the systems vary, and it is the purpose of this study to determine the relative efficiency and economy of the various types and whether the air conditions being obtained in the cars are satisfactory from the standpoint of the comfort and well-being of the passengers. At the present time there are three basic types of air-conditioning equipment being used by the railroads, although there are numerous variations of each type. The three basic types are ice, steam and mechanical compressor, in the first two of which water is used as the refrigerant. In the compressor type, however, certain kinds of gas are used as the refrigerant.

"Air conditioning of passenger equipment," said Mr. Pelley, "is of such fundamental importance to American railroads and is such a new development so far as the rail carriers are concerned that the board of directors has determined on a comprehensive research program being conducted into that subject. What the railroads want to know is what type or types are best adapted for railroad use, whether there are any improvements that can be made, which type provides the greatest comfort to the public, and which are the most economical to install and operate. Railroad managements also want to know whether some system or systems can be developed in the light of experience which the railroads have had in recent years whereby some standardization can be brought about whereby the cost of installation and upkeep can be reduced.

"Air conditioning of passenger cars is recognized by the railroads as an improvement that will eventually be in common use on railroads throughout the country. In view of the fact that in recent years the railroads have had an opportunity to experiment with and make use of various systems from a practical standpoint, the board of directors feels that a complete study at this time should bring about the development of a still greater improvement in air conditioning of passenger cars."

Santa Fe Budget

DIRECTORS of the Atchison, Topeka & Santa Fe have approved a budget for 1936 providing for the expenditure of $28,408,973. Among the major items are the following:

500 50-ton single sheathed box cars	$1,250,000
50 70-ton hopper cars	150,000
Car improvements	1,449,665
Locomotive improvements	220,294
Topeka shops	139,118
Shop buildings, enginehouses and appurtenances	164,342
Shop machinery and tools	161,758

"Firemen" To Be Employed on "Zephyrs"

A STRIKE of 1,500 members of the Brotherhood of Locomotive Firemen and Enginemen on the Chicago, Burlington & Quincy, scheduled to take place on December 9 at 6 p.m., was averted on December 8, after a conference attended by Judge James W. Carmalt of the National Railway Mediation Board; L. O. Murdock, assistant to the executive vice-president, and W. F. Thiehoff and J. H. Aydelotte, general managers of the Burlington; and M. Larson, general chairman, and J. P. Farrell, vice-president of the firemen's brotherhood. As a result of the agreement reached, a helper will be employed to assist the engineman on Diesel-electric streamline passenger trains and the brotherhood will not insist that a helper be employed on Diesel switching locomotives.

In this controversy, the brotherhood demanded that the railroad employ a fireman in addition to an engineman on both Diesel-electric trains and Diesel-electric switchers, contending that the employment of two men was essential to safety. The management held that employee and public safety was not jeopardized when such locomotives were operated by one man and that, by calling a strike, the brotherhood was trying to evade the contract which provides for a 30 days' notice for changes in present agreements.

On December 3 the Brotherhood notified the railroad that a majority of its 1,500 members were in favor of a strike, and asked for another conference with the management. This conference took place on the following day and when the railroad would not waive its rights under the Railway Labor Act, the Brotherhood set the date for the walkout at 6 p.m. on December 9. Shortly after the strike call was issued, Dr. William Leiserson, chairman of the National Mediation Board in Washington, telegraphed Ralph Budd, president of the railroad, urging mediation of the controversy. Mr. Budd interpreted the message of the chairman to mean that the Brotherhood wished to change existing agreements which, in accordance with established custom, opened existing schedules for consideration of such other changes as may be submitted by the road.

On December 8 both parties agreed to waive their rights and the Brotherhood agreed to withhold its demands for enginemen on switching locomotives. The management felt that, while its streamline trains are safe when operated with one man, it would not contest the employment of a helper because of its high regard for safety and in view of the doubt already created in the mind of the traveling public through the publicity given the matter.

Milwaukee Repairs Back to Normal Schedule

FOR the first time since 1931, the Milwaukee, Wis., shops of the Chicago, Milwaukee, St. Paul & Pacific on December 5 resumed their normal freight and passenger car repair schedule which calls for the repair of all passenger equipment during a two-year cycle and all freight equipment on a four-year cycle. As a result, 1,200 men will be employed on a 40-hr. week to repair 2 passenger and 20 freight cars a day.

Retirement Board Seeking Registration of Furloughed Employees

THE Railroad Retirement Board, charged with the administration of the railroad retirement act of 1935, has initiated steps to secure the registration of all persons who had an employment relation to a carrier on August 29, 1935. The act describes three classes of employees who are eligible for its benefits: First, those who were in active service on or after the date the law was enacted, August 29, 1935; second, official representatives of railroad employee organizations, who qualify under stated requirements; and third, persons who on August 29, 1935, were in an employment relation to a carrier, i. e., employees who were not actually in service on or since that date but who were on furlough or leave of absence, subject to call for serv-

ice and ready and willing to serve, in accord with the rules and practices of railroad employment. It is this third class which the board wishes to register at this time; other registrations will follow later.

In order to secure data concerning the class of persons having an employment relation to a carrier, but who have not been in active service since the date of the enactment, the board is broadcasting a notice calling upon each such person to send in his name and address to the board in order that the board may forward to him forms on which registration may be made. Some of the persons who have an employment relation but are not now in active service may be eligible to receive an annuity as soon as annuity payments become due and payable, 90 days after the effective date of the act, which is March 1, 1936.

Westinghouse Fiftieth Anniversary Celebrated on January 8

THE year 1936 is a "golden jubilee" year for Westinghouse, January 8 having been the fiftieth anniversary of the founding of that company by George Westinghouse on January 8, 1886, when the charter was granted to the Westinghouse Electric Company.

In commemoration of its fiftieth birthday Westinghouse, on the night of January 8, held a "family" gathering in Pittsburgh, Pa., for the 12,000 employes in that district. Simultaneously a similar meeting of Westinghouse employees was held in every important Westinghouse factory and office in the country.

A unique feature of this "family" gathering of 40,000 employes was that the complete Pittsburgh program was broadcast to all of the other meetings in plants and districts over Westinghouse's own short wave transmitter at W8XK. The program was sent out simultaneously at two wave lengths, 25.26 and 48.83 meters, and was picked up in plants and offices all over the United States and also in foreign countries.

At Pittsburgh the speakers reviewed the important contributions that Westinghouse has made to the progress of industry and to the welfare of humanity and presented a forecast of the future of the electrical industry. A Westinghouse institutional sound picture, "The New Frontiers," prepared especially for its golden jubilee, was shown to employees for the first time on this occasion. Music was furnished by Westinghouse's own organizations—the Westinghouse Band, the Westinghouse Chorus and the Westinghouse Kilty Band.

As far as is known this was the first mass gathering of all employes of a company throughout the world by means of short wave radio over its own station.

Diesel Engine Fire Caused By Fuel Tank Overflow

FOLLOWING an investigation, it was determined that the fire which occurred on the forward unit of the 3,600-hp. Diesel-electric locomotive hauling the Santa Fe "Super-Chief" on a test run between Chicago and Los Angeles, Cal., as reported in the December *Railway Mechanical Engineer*, was caused by the combustion of vaporized fuel oil accidentally introduced into the engineroom and ignited by one of several means not definitely determined. An excessive amount of fuel oil was transferred from special reserve tanks in a baggage car to fuel supply tanks on the locomotive, this excess oil overflowing through vent pipes in the locomotive roof and dropping into the engine-room where it was vaporized and mixed with air from the powerful ventilating fans. The fire was limited to the engine-room of one unit of the locomotive. Only one of the 900-hp. Diesel engines was damaged and that superficially, as the fire was quickly extinguished. The main generators were not affected, but considerable damage was done to electrical connections and fittings on the interior of the engine-room, also to thin steel sections such as the side sheathing. This type of fire would not occur in normal Diesel-locomotive operation, as the provision of a reserve fuel supply on the Santa Fe test train was necessitated only by the lack of intermediate refueling facilities which will be provided when the "Super-Chief" is placed in regular service.

Pennsylvania Orders 10,000 Freight Cars; 4,000 from Builders

THE Pennsylvania has ordered 10,000 new freight cars—6,000 from its own shops and 4,000 from outside builders. The program, work on which will be got under way as soon as practicable, will involve an expenditure of approximately $25,000,000; it is called "one of the most important and extensive equipment building programs ever undertaken in the road's history."

Included in the orders are 4,700 standard steel box cars, 3,000 automobile cars, 2,000 mill type gondolas of an entirely new design and 300 hopper cars, designed especially for the handling of cement and similar commodities in bulk. Only box cars have been ordered from outside builders, while the P. R. R. shops will also build 700 of these in addition to all those of other types.

The orders were distributed as follows:

Builder and plant	No. of Cars
P. R. R. Shops, Altoona, Pa.	3,300
P. R. R. Shops, Enola, Pa.	1,350
P. R. R. Shops, Pitcairn, Pa.	1,350
Pressed Steel Car Co., McKees Rocks, Pa.	1,000
American Car and Foundry Company, Berwick, Pa.	800
Pullman-Standard Car Manufacturing Co., Butler, Pa.	700
Bethlehem Steel Co., Johnstown, Pa.	600
General American Car Co., East Chicago, Ind.	400
Greenville Steel Car Co., Greenville, Pa.	250
Ralston Steel Car Co., Columbus ,Ohio	250

The 3,000 new automobile cars have been designed in co-operation with the automotive industry to meet its latest requirements. Included will be 2,000 50-ton automobile box cars, 300 of which will be equipped with loading devices. These will be 40 ft. 6 in. long, 10 ft. 5 in. high and 9 ft. 2 in. wide, with double side doors. There will be also 1,000 50-ton auto cars, 50 ft. 6 in. in length, with double side doors, especially designed not only for automobiles but also for the movement of automobile accessories and other materials light in weight but requiring an especially long car body. End doors will be provided in 300 of these cars. The 4,700 box cars will be of 50 tons' capacity, 40 ft. 6 in. long, 10 ft. high and 9 ft. 2 in. wide, with single side doors. The gondolas are to be of 70 tons' capacity, 52 ft. long, 9 ft. 6 in. wide and with sides 3 ft. 6 in. high; they will be designed especially for the handling of long structural shapes and other mill products. The covered hoppers will be of 70 tons' capacity.

The program is expected to provide approximately 11,000,000 man-hours of work in equipment company and railroad shops,

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both in the fabrication of cars and in the production of materials necessary for their construction. It is estimated that in the work of fabrication alone, employment for a full year will be given to 2,000 men. An additional 6,000 men will be engaged over a long period in the basic industries, producing various materials. The job is expected to be completed in approximately a year.

Streamline Train for N. Y. C. Cleveland-Detroit Run

THE New York Central is constructing in its own shops a streamline steam train which will be placed in service next spring between Cleveland, Ohio, and Detroit, Mich., via Toledo, on a round-trip daily schedule of approximately a mile a minute, an hour faster than present schedules, for the 164.2 miles each way.

The new train, air-conditioned throughout, will consist of seven cars, embodying "every device for safety and comfort." The cars are being built in the road's car shops at Indianapolis, Ind., while the locomotive is under construction at its West Albany (N. Y.) shops. The latter will be a high-speed Pacific type and its design will differ considerably from those of the New York Central's first streamline steam locomotive, the Commodore Vanderbilt, which now hauls the Twentieth Century Limited between Toledo and Chicago; it will have roller bearings on truck, trailer and tender axles.

The train will not be articulated, but will consist of a combination baggage car, two coaches, a dining car, providing full dining facilities, a lounge-bar car, and Pullman parlor and observation cars. In each car will be embodied a number of changes from the ordinary floor plan. All cars will be of steel, but with substantial weight reductions compared with standard equipment. No name for the new train has yet been selected.

Supply Trade Notes

THE ARMSPEAR MANUFACTURING COMPANY has moved its office from 250 West Fifty-fourth street to 1270 Sixth avenue, New York City.

JOHN S. GREGG, formerly of the Moise Steel Company, Milwaukee, Wis., has been appointed to the sales staff of the Milwaukee office of the Inland Steel Company.

B. H. WHITING has been appointed district manager of the Whiting Corporation, with headquarters at Cincinnati, Ohio.

THE GOULD STORAGE BATTERY CORPORATION has moved its eastern sales and service depot from 796 Tenth avenue to 549 West Fifty-second street, New York City.

J. S. HAGAN has recently been appointed a railway sales representative of The Edison Storage Battery Division of Thomas A. Edison, Inc., with headquarters at Chicago.

THE REPUBLIC STEEL CORPORATION has moved its Cleveland, Ohio, district sales office from Union Trust building to 920 Republic building. W. E. Collier continues in charge of the office as district sales manager.

E. C. ROBERTS has been appointed vice-president in charge of sales of the Detroit Graphite Company, Detroit, Mich. Mr. Roberts was associated with Detroit Graphite Company for 16 years prior to May, 1933, when he resigned as vice-president in charge of sales, and became associated with Arco Company at Cleveland in a similar capacity.

ERVIN J. SANNE, representative of Joseph T. Ryerson & Son, Inc., Chicago, has been appointed district sales manager of the Inland Steel Company, with headquarters at St. Paul, Minn.

THE BETHLEHEM STEEL COMPANY is now conducting the business formerly conducted by three Bethlehem Steel Corporation subsidiaries—the McClintic-Marshall Corporation, the Pacific Coast Steel Corporation and the Kalman Steel Corporation.

DAVID C. ARTHURS has been elected president, and Stanley W. Butler, a member of the board of the Mt. Vernon Car Manufacturing Company, Mt. Vernon, Ill., to succeed Ralph K. Weber, who has resigned as president and a director to enter the employ of the Mt. Vernon Car Manufacturing Company.

C. A. CHERRY, who has been appointed district sales manager of the Republic Steel Corporation with headquarters at Buffalo, N. Y., is a graduate of the Johnstown, Pa., high school. After graduation, he became connected with the Cambria Steel Company in the Wire Sales division. In 1917 when this company merged to form the Midvale-Cambria Steel Company, he served in the Philadelphia office of the new organization, the following year becoming private secretary to W. H. Donner, head of the Donner Steel Company. Shortly afterwards he was appointed assistant vice-president in charge of sales of that company, and in 1930 when the Donner Steel Company became a part of the Republic Steel Corporation, he became assistant manager of sales, Carbon Bar division.

B. C. WILKERSON has been appointed service engineer of the Superheater Company. Mr. Wilkerson, whose headquarters will be at New York, will service Elesco equipment on railroads in the New England territory. For many years Mr. Wilkerson was a locomotive engineer on the New York, New Haven & Hartford. Leaving the railroad he became service engineer and then chief service engineer of the Franklin Railway Supply Company. He later became associated with the Bradford Corporation, specializing in locomotive throttles, and previous to his association with the Superheater Company was engaged by the American Throttle Company on special service work on the Bradford and Wagner locomotive throttles formerly manufactured by the Bradford Corp.

Obituary

JOHN OBERMIER, vice-president of the Timken Roller Bearing Company, Canton, Ohio, died of pneumonia at Tucson, Ariz., on December 29.

MARINAC'S RAIL ODDITIES

MARINAC has furnished us with the following explanation of the three cartoons which appear elsewhere in this issue:

Page 23. The small model locomotive which is complete in every detail was constructed by Eugene Stevens, of Norway, Maine. In working order it weighs only 150 lb. It is 5½ ft. long and can pull a load of a ton at high speed over its improvised track. The boiler holds two gallons of water and develops 120 lb. steam pressure, using coal as fuel. The tracks are laid trestle fashion on cedar posts. The midget steam gage, scarcely the size of a man's thumb, registers the pressure accurately. The cylinder bore is 1 5/16 in. and the stroke 1¾ in. The tender carries six pounds of coal and 2½ gallons of water.

Page 42. Traffic blocks in the vicinity of fires in Amsterdam, Holland, are prevented by ingenious portable bridges that carry street cars and other vehicles over the hose lines. In a recent test these bridges enabled traffic to proceed at a normal pace along a street which was crossed by eight lines of hose. The bridges which are used to carry automobiles and horse-drawn vehicles consist of three low steel arches. The hose lines pass between the supports of these arches. For street cars, short sections of supplementary rail are used, with tooth-like lower edges and sloping ends. When these sections are laid upon the permanent rail the hose lines are passed through the sections, as shown.

Page 43. To solve the problem of handling expeditiously the vast quantities of mail that pour into the largest city in the world every day, London, England, postal authorities have constructed a network of underground tunnels for transferring the mail from the central postoffice to the branch stations in the outlying parts of the city. The sacks are conveyed from one point to another by means of small driverless trains, which travel at a speed of 25 miles per hour. When the train is loaded, an attendant pulls an overhead cord and the train starts off with its load, which is sometimes as much as 300 tons.

THE FIRST OF THE NEW 4-8-4-

FOR THE

WEIGHT IN WORKING ORDER, POUNDS				
On Drivers	Eng. Truck	Trailer Truck	Total Engine	Tender Loaded
273,000	89,500	Front 53,000 Rear 61,500	477,000	381,700
WHEEL BASE			TRACTIVE EFFORT	
Driving	Engine	Eng. & Tender	Main Cylinder	With Booster
19' 3"	46'-10½"	98'-5¼"	66,960	81,035
BOILER		CYLINDERS		
Diam.	Press.	Diam.	Stroke	Driving Wheel Diam.
91-11/16"	250 lb.	27½"	30"	72"

LIMA
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